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Contractors and Engineers Monthly

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PICKS and SHOVELS

By O. E. POTTER

WPA Golfers

The outdoor life has had many bards to sing its praises, as has the merry old game of golf, and on these rare summer days, a good many of us have not-too-well-stifled longings to be out on the fairway—at least we trust we'd be on the fairway—instead of chained to a desk.

Some WPA workers we heard about lately apparently were less able to resist the lure of the little white ball. It seems that these workers were engaged on a sidewalk project in Braintree, Mass., which ran alongside the Braintree Golf Club. The WPA workers brought their golf clubs to work every day and the greenskeeper said, according to a story in *The Nerba*, that they utilized every opportunity to get in a little golf, always keeping a weather eye out for the appearance of an inspector on the job.

The situation got so bad that the greenskeeper finally had to call in the police because the WPA golfers were crowding the club members off the course.

Frightened Easterners in a Desert

On a mid-summer day a state highway department maintenance crew was busily carrying on the tradition of well-maintained roads throughout the year on a desert highway somewhere west of Phoenix. They worked along merrily, hatless and seemingly unaware of the blazing desert sun.

A Cadillac Eight drew up and stopped nearby, because of a flat. The driver of the car called out "I'll give any man ten dollars if he'll change my tire." Immediately the entire crew threw down their tools and started for the car.

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C. & E. M. Photo

Fresh Water for Concreting Came from the Well Made by a Ring of Sheet Piling With the Core Clammed Out on the A. I. Savin Constr. Co. Job

Local Aggregate For County Roads

Roads and Bridges Repaired and Kept Clear of Snow Drifts by Well-Balanced County Highway Organization

By ROBERT L. WILLIAMS,
Chief Engineer, Road and Bridge Dept., Luzerne County, Pennsylvania

LUZERNE COUNTY, Pennsylvania, which is located in the northeastern part of the state, has an area of about 900 square miles and a population of approximately 450,000. The terrain is mostly mountainous with elevations ranging from 500 to 2,000 feet above sea level.

The county highway system, which is under the direction of the Board of County Commissioners, consists of 131 miles of roads, and about 460 bridges. All of these bridges are not on county roads, the majority of them being on township roads. The County Commissioners, as a form of county aid to townships, have assumed the maintenance of all bridges in the townships, exclusive of those on state highways. In addition, the Commissioners have built and maintain seven bridges across the Susquehanna River, the length of these bridges varying from 800 to 2,000 feet.

The County Commissioners also have constructed and maintain five viaducts and bridges over railroad right-of-ways on roads that are not on the county highway system.

The county highway system is made up entirely of secondary or feeder roads, in that the majority of them connect with the state highway department primary routes.

At the present time there are 21 miles of earth roads, the balance being black tops of various types. Some have Amiesite tops on water-bound macadam bases; some have penetration tops on broken stone bases; some are native stone bases, surface-treated and others are earth roads, surface-treated.

(Continued on page 10)

Stone Bridge Replaced By R. C. T-Beam Span On Conn. Highway

(Photo on page 44)

INCREASING traffic along the shore road on Route 156 through Old Lyme, Conn., made it necessary to remove a number of dangerous curves and grades. The new Black Hall River Bridge, built entirely with state funds, eliminates three dangerous curves and a bad grade condition. The new bridge, a 30-foot clear span reinforced concrete T-beam structure with granite facing, is situated about 300 feet downstream from the old 20-foot span stone arch, built in 1898.

Quantities and Unit Prices

This project included 900 cubic yards of unclassified excavation at $4.00; 560 cubic yards of reinforced concrete at $14.00; 30,000 pounds of deformed steel bars at 3.5 cents; 74 cubic yards of granite facing at $14.00; 71 feet of concrete railing at $4.00; 109 square yards of concrete wearing surface at 50 cents; 2,500 square feet of 2-inch wood flooring at 30 cents; and 7,500 feet of timber piling at 25 cents per foot and 25 cents per foot for driving. The estimated cost of the bridge and approaches was aproximately $37,900.

Foundation Conditions

On the site of the bridge at midstream there was an average of 6 feet of water and about 33 feet of mud. The contractor built a cofferdam 80 x 74 feet, using 30-foot steel sheet piling. The piling did not penetrate to hard bottom but was driven two-thirds of its length into the mud. Two frames of 12-inch timbers were built in place, the top frame floating before dewatering, and the bottom frame located 6 feet lower after dewatering to river bed elevation.

Muck excavation was handled with a Northwest crane and an Owen clamshell bucket down to elevation 9.5 feet below mean sea level, casting the muck close against the cofferdam on the downstream side. A 25-foot trench was cut through one of the previously constructed approaches at about high tide level which kept the water upstream at an even elevation and took care of the normal stream flow. The muck cast on the downstream side protected the cofferdam from tide action and also acted as a seal so that after the initial dewatering it required only a few hours pumping each day with one Rex 4-inch centrifugal pump to keep the cofferdam dry.

A. I. Savin Constr. Co. Built Granite-Faced Structure on Piles Driven Through Muck

Piles and Foundations

A total of 186 timber piles 40 feet long were driven with a 5-ton Vulcan steam hammer to refusal. The cut-off elevation was 9 feet below mean low water. A flooring of 2-inch planks was supported on the piles and 6 inches below cut-off elevation to prevent the concrete of the footings from settling into the muck. The footing was a spread type 2 feet thick and battering up an additional 6 inches from the outside face to the neat lines of the abutments. Four reinforced concrete struts, 3 feet wide and 2 feet thick, were placed between footings to prevent any possible movement due to thrust after backfilling.

Concreting

Concrete for the footings was mixed in a Ransome 2-bag mixer and placed with chutes. Nazareth cement and Trus-

(Continued on page 17)

BUILDING ANOTHER LINK IN TVA'S CHAIN OF DAMS

Cranes Handle Both Panel Forms and Concrete Buckets Inside the Lock at Pickwick Dam in Tennessee. See Page 11.

The Santa Clara Valley Dams

Methods and Equipment Used on Seven Calif. Dams

By HAROLD I. WOOD,
Supervising Field Engineer, Santa Clara Valley Water Conservation District

(Photo on page 44)

THE underground water level of the Santa Clara Valley, California, has been dropping at an average rate of about 6 feet per year for the 15 years previous to construction of the District's works. The water had dropped because of deep well pumping to provide irrigation water for orchards and the extensive fruit industry around San Jose. Surface water for irrigation is virtually non-existent.

The Santa Clara Valley Water Conservation District of 130,000 acres was organized in November, 1929 with headquarters in San Jose. The District began the construction of six storage dams in the fall of 1934 on the principal streams into the Valley. The dams are of rolled earth-fill type. The construction was scheduled and progressed to permit storage of the run-off of the 1935-36 season.

The first season's operations resulted in the rise of the water plane over the central part of the valley by April 1, 1936, of 13 feet which seems to indicate that the District's work will accomplish a rise in the water table about twice as fast as it had been dropping each year previously.

Preparation of Foundations

The preparation of foundations consisted of stripping of all perishable material from the entire site, then the excavation and removal of all pervious material from under the upstream or impervious portion of the dams. A cut-off trench was next excavated into the impervious foundation at about the center of this upstream impervious portion of the dams. This cut-off trench backfill and upper impervious sections of the dams were composed of the material high in clay content placed in layers as rolled fill.

At Calero Dam, a 40-foot width of 25-foot long steel sheet piling was driven across a weak section of the foundation near the foot of the right abutment. At Almaden Dam, some special grouting of seams in the cut-off trench was accomplished to insure a seal. The excavations for cut-off trenches at all dams except Coyote and Almaden were made mainly with Le Tourneau scrapers. The steeper and deeper trenches at all dams were excavated with power shovels.

Specifications

The specifications provided for constructing the embankments from material secured from excavation for cut-off trenches, outlet works and borrow pits developed within the areas of the reservoirs or vicinity of the dams. Excavation from spillways was also used in the embankments. The backfill for the cut-off trenches contained the highest clay content material. The upstream portions of the dams, or impervious sections, were constructed of selected fine material, and downstream portions of the dams consist of coarser and relatively more pervious material. All embankment material was placed in horizontal layers not exceeding 6 inches in thickness, measured after rolling or compacting. Each layer was rolled to make the densest mass practicable with minimum amount of water. All lumps or rocks large enough to interfere with rolling and compacting were either broken up or placed on the extreme downstream portions of the dams. Sheepsfoot rollers were used for compaction. On Almaden and Calero Dams, the contractors used a specially-constructed roller unit consisting of two scraper bolls bolted together at their ends and followed by double tandem sheepsfoot roller units. On all dams except Calero, water conducted through pipe and hose lines was applied to the embankment material by sprinkling. A water truck was used at Calero. At Coyote Dam, an overhead 3-inch pipe line was constructed across the canyon on a cable and four pendant hose lines were used from this overhead pipe for sprinkling.

Field and laboratory tests were made continuously to check the moisture in the embankment, suitability of materials and the compaction.

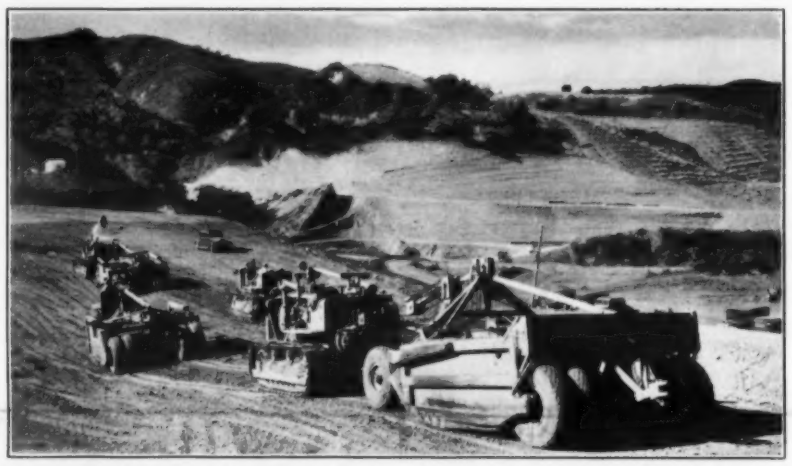
Almaden Dam

Almaden Dam, located near the town of New Almaden, is of the rolled earth-

(Continued on page 20)

Material on All the Santa Clara Dams Was Compacted With Sheepsfoot Rollers

Conservation District Planned Huge Project to Store Underground Water for Irrigation



Borrow Pits "at the Four Corners of the—" Embankment Furnished Dirt for the Stevens Creek Dam

C. & E. M. Photo

Mud-Jack Repairing Road to Madden Dam, Canal Zone

Mud-Jack Kept Busy in Zone

Driving along the road to Madden Dam in the Canal Zone, our editorial eye fell upon a Mud-Jack working beside the road. Our reportorial nose-for-news got the better of us, so we stopped to find out what it was all about.

The fill at that particular section of the road had settled somewhat, allowing one of the two concrete strips to follow suit for a stretch of about 65 feet. To rectify this, the Mud-Jack had been put to work and was steadily and surely raising the pavement to its proper position. Two men and a boss, working a little less than two days, finished the job. This same Mud-Jack is in regular use on the roads in the Canal Zone.

Fighting Heavy Snows in Donner Pass, Calif.

Donner Summit on U. S. Route 40 in California provides more trouble from snow than almost any other point in the United States. It is a heavily traveled road and must be kept open throughout the year. The annual snowfall amounts to about 500 inches and single storms that last as much as a week will pile up 7 to 8 feet of snow in the pass. These snowfalls are fought continuously with rotary plows by the Maintenance Department of the California Division of Highways. It is also interesting to note that one-third of the state highways of California are subject to snowfall.

Insurance Rates Require Action

High Rates Charged Contractors for Workmen's Compensation Compared to Rates Charged Govt. May Ruin Contracting Business

By ROBERT W. HUDSON,
President, Michigan Road Builders' Association

FOR the past several years the contracting business, along with many others, has been forced to look into a rather dark and gloomy future. Some of the dark clouds that have covered our horizon are breaking up and the sun is beginning to shine through. However, if we look far enough into the future we can see other dark clouds here and there. If they are not broken up the outlook may again become rather dark and gloomy. These clouds do not represent a shortage of work but rather the high rates for compensation insurance being charged by insurance companies throughout the nation.

This problem is rapidly becoming so acute that it now threatens the very existence of the contract method of construction.

The very essence of the contract system is competitive bidding on projects. One of the items which must be considered in the preparation of a proposal is the amount to be paid for compensation insurance. As the rates for this insur-

(Continued on page 19)

Sewer Shaft and Tunnel Through Sand and Mud

Operations at Shaft 2 of Rosoff Tunnel Corp. on Intercepter Along East River in New York

A HANDY vacant lot and a pair of empty stores across the street for the "hog pen" led to the choice of 98th Street and First Avenue, Manhattan, as the site for Shaft No. 2 of the Rosoff Tunnel Corp. on its Contracts 6, 7 and 8 for the upper Manhattan intercepting sewer for the Department of Sanitation, New York. Unlike Shaft 1 described in an earlier article, (C.&E.M., June, page 7) Shaft 2 was sunk in very soft ground of sand, clay and muck.

Sinking the Shaft

A line of steel sheeting was first driven 40 feet deep around the periphery of the 14 x 14-foot shaft with a McKiernan-Terry No. 7 hammer swung from a Northwest crane. The material was removed from within the shaft with a 1¾-yard Blaw-Knox clamshell on the crane. Braces were placed every 10 feet, using 12-inch I-beams framed. The shaft is 35 feet deep from ground level to the subgrade. After the shaft had been excavated it was sealed at the bottom with 2 feet of Transit-Mix concrete reinforced with two layers of ¾-inch bars spaced 6 inches on centers. The seal was bonded to the sheeting with 1¼-inch hooked rods run through holes burned in the sheeting. The top of the seal is 3 feet below the subgrade of the tunnel and therefore acts as a sump.

Following the completion of the seal, the "deck" or air seal 16 feet below street level was poured with two 3-foot diameter shafts piercing it. The deck is reinforced with two 12 x 20-inch I-beams 14 feet long welded to the sheeting and carries the same rod reinforcing as the seal. Two I-beam rangers were welded to the sheeting at the top of the deck to prevent its flowing upward and the deck permitted to set for 72 hours in zero weather but well protected from the cold.

Starting the Tunnel

After the decks had set, air was put on and two eyes cut at opposite sides of the shaft for tunneling. Hydrogen and oxygen were used for cutting under air pressure. The sewer in this section is 7 feet 6 inches high by 6 feet 6 inches wide, horseshoe shaped, with the top a 3-foot 3-inch radius circle from the spring line. The sewer has an 11-inch concrete wall.

Excavation under about 12 pounds of air was continued for 100 feet in either direction from the shaft and then a pair of horizontal locks was built. A ring of Truscon plates is used for lining the excavation prior to the pouring of the concrete sewer. The half circle of liner plates is put in at the top, bolted and braced with a trench jack consisting of a 2-inch jack and 2½-inch pipe. The liner plates are 16 inches wide so that 16 inches of tunnel is mucked at a time.

(Continued on page 35)

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Each year, increasing numbers of Americans respond to the suggestion, "See America First." As their cars move from State to State, they are driving, everywhere east of the Rockies, on thousands of miles of TEXACO Asphalt highways of many types: Penetration Macadam in New England, Sheet Asphalt in Michigan, Heavy Surface-treatment in Florida, Low Cost Road-Mix in Yellowstone National Park, Double and Triple Surface-treatment in Texas.

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Has Relief Labor Improved?

The answer is "Yes" in the eight southwestern states we have recently covered with some degree of completeness. Perhaps it is pertinent to ask another question that is not answered quite so quickly, "Why?"

When relief labor was sought for highway contracts under the requirements of the various relief acts there were complaints without number that the labor was worthless. Those complaints were quite justified. The agencies that were handling the requests for labor were new at their work and made many errors. Many men out of work for some time were willing to tell stories of their prowess at most any job for which the agency wanted to furnish labor in the county. These naturally resulted in great losses to the contractors who had to bear the brunt of the experimentation.

We even found one county where the labor was entirely of the "white collar" class and the men were entirely unfitted for the work they were expected to do with pick and shovel. Many of them made valiant efforts to do an honest day's work for the relief wages and failed simply because they were not trained to the work and, in addition, had not known the taste of enough food to keep up their strength.

What was done? The political organization in the community asked the highway department engineers to send any men of that type to them and they would finance them so that they could get the food, with the understanding that they would repay their loans when they were able to work again. To the credit of the political organization this was carried on without reference to party and resulted in a great and immediate improvement in the ability, or strength, of the men reporting for work.

Now what has happened? Labor is getting trained to the type of work that has proved most beneficial to the community in results, highway construction, and works better and faster. Where excessive man-hour requirements must be met, it is necessary either to pack the men in so close on such work as structure excavation that they cannot work effectively or to provide an insufficient number of picks and shovels so that they will not get the work done too fast and not use up the man-hours allotted to that particular job. These are actual cases that have occurred in the last few months.

The rapid improvement in the building situation in many states has also reacted upon the construction of the many underpasses and other civil engineering works because it is difficult to get carpenters. Fortunately the restrictions on the locale of labor are being lifted now so that the contractor is not having quite the difficulty in getting his skilled labor that he experienced even a few months ago.

We witnessed the spreading of granulated native rock asphalt as a resurfacing material on a highway in one of the Rocky Mountain states a few weeks ago and were delighted to see the team work of a group of men working for a contractor and all having individual responsibilities requiring a perfect timing. They had been selected from the relief rolls and had been molded into a real hard-pushing team in a remarkably short space of time.

Yes, the grade and quality of relief labor can truly be said to have greatly improved. There is a greater desire to deliver a full day's work for a day's pay, indicating the improvement in the morale of the unskilled laborer.

Revision in Hours of Work for Skilled Labor

Reports indicate that progress on some Works Program highway and grade crossing projects is being seriously handicapped by the inability or serious difficulty of contractors in obtaining certain kinds of necessary skilled labor. This situation undoubtedly will become more acute as additional projects are placed under construction and as construction activities approach the peak for the season. The effect of this condition in some instances has been to shut down projects after the skilled labor available on such projects had served the limit of hours per month now allowed, thus throwing out of employment other laborers of the intermediate and unskilled grades, some of whom had not had their full allowable time for such month.

The section of Executive Order No. 7046 relating to hours of work under the Emergency Relief Appropriation Act of 1935 provides that the limitations respecting hours of work established therein shall apply except (1) in the case of an emergency involving public welfare, or the protection of the work already done on a project; (2) in special and unusual circumstances when the limitations are not feasible or practical, and (3) for supervisory and administrative employees.

In order to meet the situation created by a shortage of certain kinds of highly skilled labor, the Secretary of Agriculture, as administrator of the funds allocated from the Emergency Relief Appropriation Act for highway construction and the elimination of hazards to life at railroad grade crossings for expenditure in accordance with the provisions of the Federal Highway Act, has approved a procedure whereby the Chief or Acting Chief of the U. S. Bureau of Public Roads is authorized to determine whether the hours for skilled labor, fixed generally at 8 hours a day and 130 hours a month, "are not feasible and practical" in the case of any Works Program highway or grade crossing project in connection with which conditions such as those outlined exist, or may arise, subject to the conditions (1) that there be furnished for the file of each such project a statement to the contractor from the U. S. Employment Service to the effect that such agency is unable to furnish necessary skilled labor of the kind desired, together with a sworn statement by the contractor setting forth his efforts and inability to secure such skilled labor from other sources, and (2) that any revision of hours of employment which may be approved for a particular project shall not exceed in any case the limitations which may be fixed by the laws of the State in which the project is located.

Requests in triplicate for revision of hours of employment of specific kinds of skilled labor on any project should be initiated by a state highway department and forwarded with one copy of the supporting papers to the District Engineer of the Bureau of Public Roads. The District Engineer will then indicate his recommendations and forward two copies of the request with the supporting papers to the main office of the Bureau. If the request is approved, an approved copy will be returned to the state highway department and constitute authority for granting the revision in hours requested.

Contracts will continue to be advertised and awarded limiting hours of employment as stipulated in the required special provisions and in the event a revision in the hours of employment of skilled labor becomes necessary, the procedure outlined above may be followed.

All-American Canal More Than Half Completed

Forty-four and one-half miles of the 80-mile All-American Canal have been excavated, according to a recent report in *The Reclamation Era.* A total of 34,994,900 cubic yards of earth and rock has been moved in the 17 months since construction began. The dirt has been moving at a rate sufficient to dig a hole each day big enough to hold an 18-story building.

The All-American Canal, the nation's greatest irrigation ditch, will replace the present main canal serving the Imperial Valley of California and traversing 50 miles of Mexican territory. A canal entirely upon American soil has been the hope of the 60,000 inhabitants of the Imperial Valley since settlement began there in 1901. The canal will tap the Colorado River at a point about 15 miles north of Yuma, Ariz., and will cross the desert of the east side mesa on a line paralleling and only a few hundred feet from the international boundary.

While a dozen contractors are at work on various sections and structures of the canal, the largest volume of excavation to date has been done by the W. E. Callahan Construction Co. and Gunther & Shirley, who are digging the canal through a range of sand hills which lie along the Colorado River. The holders of this contract have excavated a total of 26,565,400 cubic yards of earth and have completed 68 per cent of their work. Here three dragline excavators, each capable of moving 12 yards of earth a minute, are in operation.

The excavation of the canal through the irrigated section of the Imperial Valley was done by Government forces, as many as 300 men and teams being recruited from the nearby farms. With the completion of 17½ miles of canal in this fashion, the force account work has been completed.

R. B. Williams, Construction Engineer in charge of the canal, and the Imperial diversion dam at its head, reports that a total of 279 carloads of materials have been received from twelve states to date for the construction of the canal. These materials include 124 cars of lumber, 51 cars of reinforcing steel, 39 cars of cement, 14 cars of sheet piling, 5 cars of structural steel, 3 cars of nails, 7 cars of fittings, 2 cars of automobiles, 5 cars of poles, 3 cars of pipe, 1 car of machinery, 2 cars of brick, 1 car of wall board, 1 car of roofing, 1 car of transformers, 2 of coal tar, 12 of road oil and 6 of asphalt.

These shipments originated in California, Oregon, Missouri, Idaho, Pennsylvania, Washington, New York, Illinois, Ohio, Wisconsin, Colorado and Indiana.

Traveling Lab Proves Worth in Nevada

A traveling field laboratory, fully equipped to make soil analyses in addition to carrying drafting accessories for plotting geological classifications on charts, has recently been put in service by the Nevada Highway Department.

About 10 feet long and 7 feet wide, with plenty of room inside for persons to stand erect, the new two-wheel portable "Field Lab" has adjustable disc-bottomed metal posts at each outside corner for stabilization when detached from its towing car. A collapsible step at the rear entrance can be raised to prevent dragging while being moved from station to station. A window on each side and another in front provides ample light. The walls are of sheet metal insulated with cellulose fiber board.

The equipment includes a work bench across the front end of the trailer, a porcelain sink for use in making acid tests, and a "furnace" to generate heat during soil tests. A wide, adjustable drafting table is placed in front of a side window to facilitate the plotting of formations at selected stations.

This innovation in the department's field work, which was described in a recent issue of *Nevada Highways and Parks,* will supplement the existing facilities at headquarters and only such samples requiring closer study or finer determinations will be sent to Carson City.

Practically all shrinkage field moisture equivalent tests can be made with the equipment carried on the trailer.

Manual of Structural Design

The theory of structural design has been covered in detail in many excellent text books and reference works and the graduate engineer is quite familiar with the subject. In the course of his work, however, he has many occasions to consult such books, and to meet this need the "Manual of Structural Design," by Jack Singleton, Mem., Am. Soc. C. E., and Consulting Engineer, has been published.

It is a new book covering the field of structural steel and reinforced concrete design, applying the theory of structural design in the formulation of data that bears directly on the case in question. It covers such subjects as general specifications for reinforced concrete, universal beam tables, reinforced concrete slabs, structural shapes and many others, arranged in tabular form for ready reference.

Copies of this book may be secured from H. M. Ives & Sons, Publishers, Topeka, Kans. Price: $4.50.

New 13-Mile Road in Black Hills, Mont.

Winter Frosts Showed Necessity for Stable, Drained Subgrade; Special Attention Given to This on Oil-Treated Highway

THE last connecting link of hard-surfaced roads between Miles City, Montana, and the Black Hills is nearing completion under a contract awarded to Prahl & Sawtell, Inc., a well-known Montana road and railroad contracting firm which, up to the beginning of the 1936 season had completed 150 miles of highway for the State of Montana. The project is part of the state program for 1936, which contemplates the expenditure of $1,500,000, principally for the improvement of trunk roads throughout the state.

The section now under construction begins in the fertile irrigated valley near Miles City and extends well into the rugged foothills of the Black Hills. The top soil is heavy gumbo which hardens to rock-like consistency after rain. This soil condition and the cold and rain of a late spring delayed the early grading work which was begun on March 19. Much of the work consisted of widening and bringing the road up to grade with cut and fill, the maximum cut being 21 feet and the deepest fill 20 feet.

Springs a Problem During Grading

For part of the distance in the hills the original road had a high and low side, and an Austin-Western elevating grader was used for casting across the road to bring the low side up to grade and at the same time widen the road or develop the ditch line. A 12-foot A-W blade grader with a 60-hp tractor completed the ditching and shaping of the berm.

At one spot which was being brought to grade by a 12-yard Austin-Western hydraulic scraper and Cletrac 80 tractor, surface springs were encountered which gradually filled the cut with water as the work progressed. The rig was finally taken off the job and ditches were dug at both sides of the road down to bed rock, then drainage ditches were drilled and blasted to insure adequate drainage as the moisture works through to the grade. As the ditches were carried down and the surface material drained and then dried to a depth of 1 foot and the scraper put on the job again, the material would be taken off until the ground again became too mirey to dig.

With the section completely drained on both sides, about 3 feet of pit run gravel was dumped into the cut, insuring a permanent subgrade free of water while bringing the cut up to grade. In spite of these complications, the scraper had an average of 600 yards of material moved per 8-hour day, bank measure.

Stable Subgrade Important

Great care was taken to insure a stable well-drained subgrade for the entire project. Reinforced concrete pipe of various sizes is used to carry off surface moisture and prevent its penetration into the subgrade. This penetration was the principal reason for the failure of the old road during the spring season when the heaving action of the winter frosts turned parts of the road into mud holes with "no bottom." To span the larger water courses, bridges of treated timber are used.

Excavation

There are about 215,000 yards of unclassified excavation and 5,000 yards of structural excavation on the entire job. In addition to this there is another 5,000 yards of ledge rock which will be used for subgrade stabilization where the going is unusually poor, for bridge approaches, and similar work. Hand-laid riprap is used for supporting walls.

When Working in Cuts Such As This, The Elevating Grader Dug in Both Directions With No Dead Heading

Surface Treatment

The specifications call for the laying on the 5-inch subgrade of a 3-inch gravel wearing course, oil-treated. The pit-run gravel for the sub-base is taken from sand bars on the Yellowstone and Tongue Rivers and loaded into trucks at an average haul of about 3 miles. The wearing course will be ¾-inch gravel, graded to meet Montana state highway specifications. This material will be oiled with a pressure distributor and mixed in place by motor graders working in tandem. The aggregate will then be rolled. Such water as is required for the job is obtained locally from wells.

Personnel

The crew on the project consists of 35 men, under George Hoover, Superintendent for Prahl & Sawtell, Inc., and the project is expected to be completed about August 1. When the road is completed and approved by Fred Quinnell, Jr., State Engineer for the U. S. Bureau of Public Roads, the Montana State Highway Commission will take charge of all maintenance.

Rivers of Nevada, with few minor exceptions, flow toward the center of the state and never reach the ocean. Several of the better known streams, such as the Humboldt, Carson and Walker Rivers, lose themselves in great "sinks" in the interior.

—*Nevada Highways and Parks.*

Built for Heavy Service
FULL SIZED
CORRECT WEIGHT
PLENTY OF POWER
and with all
NORTHWEST
ADVANTAGES
● In building the Northwest Model 15, 3/8 Yd. and Model 18, 1/2 Yd. Shovels, Cranes and Draglines, Northwest engineers designed them with the work they must perform definitely in mind—they have been built up to a job not down to a price—yet their cost is within the reach of every contractor.
These Northwests bring you a combination of features found on no other machine of the same capacities. The "feather-touch" control, the Cushion Clutch, Northwest Welded Boom and Stick, Cast Bases, a Manganese Front Dipper and the Northwest Independent Crowd are all standard equipment at no extra cost.
Before buying a machine of 3/8 or 1/2 yd. capacity be sure and get full details on Models 15 and 18. A catalog on request.
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1730 Steger Building
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BUILT IN A RANGE OF 15 SIZES
NORTHWEST
3/8 YARD CAPACITY AND LARGER
MODEL 15
3/8 YARD
CONVERTIBLE from CRAWLER TO TRUCK AND VICE VERSA
MODEL 18
1/2 YARD

Motor Truck Unit for Maintenance

Bay State Maintenance Crew Has Compact Truck Outfit With Four Men and Heating Kettle and "Slow" Sign on Wheels

(Photo on page 44)

DRIVING over the four-lane concrete pavement of U. S. Route 1 just after we had crossed the Rhode Island-Massachusetts line, we met a Bay State maintenance crew filling joints and cracks. The outfit of motor truck, heating kettle and four men was working so smoothly that we stopped to watch the proceedings.

The Ford V-8 motor truck carried two drums of Shell 170-MP asphalt and the four men who made up the crew. It was towing a Connery heating kettle, the tongue of which was lashed securely to the rear axle of the truck by a chain. A Littleford heater at the forward part of the kettle and beneath the tongue furnished heat for melting the asphalt and also for heating the tips of the conical pouring pots.

The truck was run along the shoulder so that the drip from the draw-off cock would not fall on the pavement.

Slow Sign on Wheels

A "Slow" sign measuring about 3½ x 2½ feet and painted white with the word "Slow" about 15 inches high in black was mounted on a triangular base with two 4-inch diameter iron wheels at the back and one caster wheel at the front where the handle for pulling the sign was attached. This sign was pulled along the road by hand and kept at a sufficient distance behind the four members of the maintenance crew to cause motor traffic to steer away from the pouring, warning it to slow down.

This crew of four men used between 3 and 4 barrels of asphalt material a day. The distance covered is variable as it depends entirely upon the number of cracks in the pavement. No figure was obtainable of the actual number of linear feet poured per day.

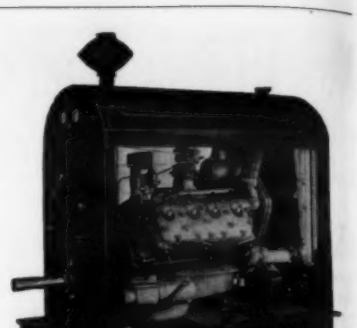
C. & E. M. Photo
Maintenance Crew Refilling Joints in Concrete Pavement

This maintenance crew was operating near Attleboro, Mass., which is District 6 under the direction of H. O. Parker, District Engineer, Taunton, Mass., with Archie Walden, as Foreman.

Industrial Power Plant Uses Ford V-8 Motor

A new industrial power plant, equipped with a Ford V-8 motor, has been announced by K. R. Wilson, Lock St., Buffalo, N. Y., exclusive manufacturer of approved Ford shop equipment. This compact unit is designed as a power plant for electric welders, air compressors, hoists, and similar equipment.

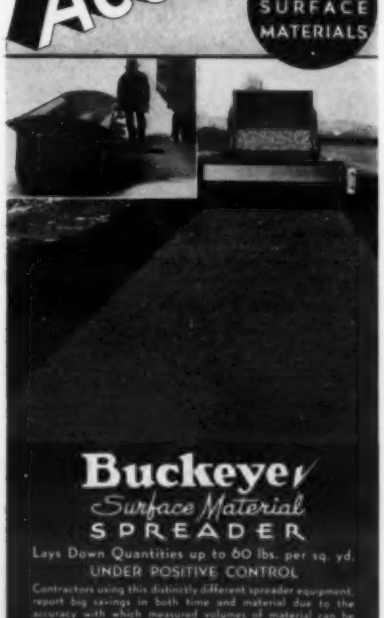
This power plant uses the heavy-duty Ford V-8 truck engine, with large clutch, largest capacity truck radiator, six-blade fan, new style ball bearing water pump and double V belt drive. The unit includes a complete electrical system, starter, generator and 17-plate battery. The battery and gasoline tank are mounted in the base and the engine is rubber mounted to insure quiet operation. The engine is equipped with a governor and the dash board with ammeter, oil pressure gages, choke, throttle, starter button, clutch lever and Yale ignition lock.



The Wilson Industrial Power Unit With Ford V-8 Engine

Complete information and data on operating costs may be secured direct from the manufacturer.

HERE IS THAT MUCH NEEDED
ACCURACY for SPREADING SURFACE MATERIALS

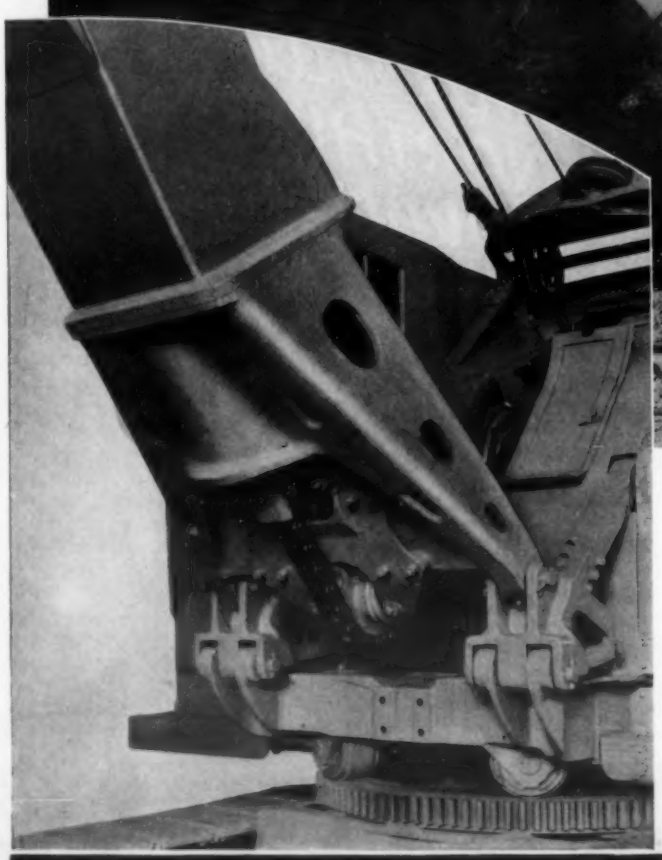


Buckeye Surface Material SPREADER
Lays Down Quantities up to 60 lbs. per sq. yd. UNDER POSITIVE CONTROL
Contractors using this distinctly different spreader equipment report big savings in both time and material due to the accuracy with which measured volumes of material can be spread exactly where wanted. It works forward or reverse, equally efficient for new construction, resurfacing or patching. Truck speed does not affect accuracy of spread. Gets close to guard rails or other obstructions, spreading full width of the machine. Write for complete facts.

BID THE Buckeye WAY
ask for our operation data before you bid

The BUCKEYE TRACTION DITCHER CO.
Findlay, Ohio

KOEHRING



KOEHRING HEAVY DUTY

THE KOEHRING CHAIN CROWD

— is a single continuous chain traveling *inside* of the high strength welded boom. The boom can be quickly and easily raised or lowered without manual adjustments or affecting the crowding effort. The chain tension is automatically maintained regardless of boom movement.

KOEHRING COMPANY
Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

Heavy-Duty Paving for Old Bridge

By HAROLD O. HAYES

AN economical way to apply a heavy-duty surface to old bridges with timber stringers and plank sub-floor has been demonstrated on the old bridge structure over the Great Northern tracks on University Avenue, S.E. near Fourteenth St., in Minneapolis, Minn. The new concrete surface replaces paving brick.

University Avenue carries a large volume of the vehicular traffic between Minneapolis and St. Paul. Traffic includes heavily loaded trucks as well as passenger vehicles.

The old structure consists of steel girders with steel floor beams. On these, 6 x 14-inch creosoted joists are supported as shown in the diagram. Four-inch x 12-inch planks are spiked to these joists and serve as the sub-floor.

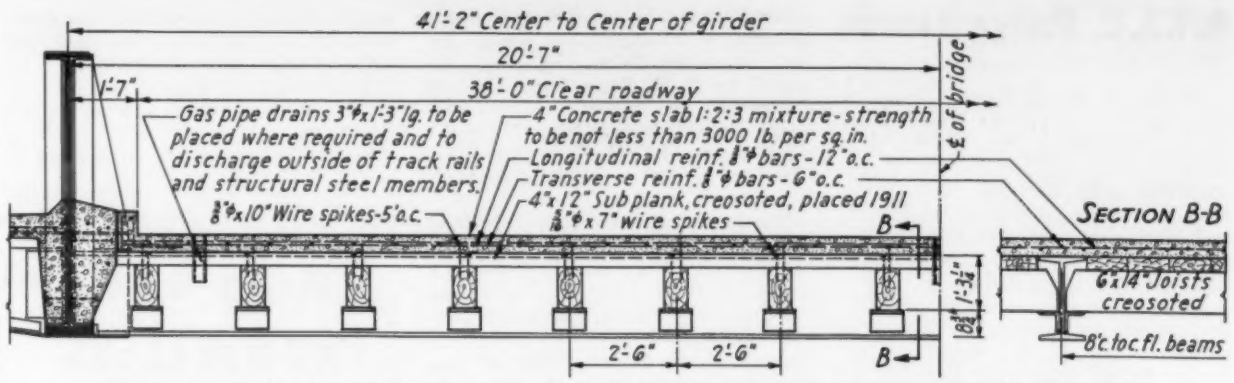
Over this the new pavement was placed. It consists of a 4-inch concrete slab, reinforced at the center of the slab with ⅜-inch round bars spaced 12 inches center to center longitudinally and 6 inches on centers transversely.

The concrete was placed late in November of 1935. Aggregates and water were heated and the deck was protected from freezing with heat. The excellent quality of the concrete is shown by its 7-day strength, 3,500 pounds per square inch in compression at 7 days, when it was placed in service.

A longitudinal joint was placed at the center of the slab and transverse joints were placed at intervals.

Two interesting details of the construction were the installation of the drains, which have bolts through the upper end at right angles to keep large stones from plugging the pipe; and positioning the reinforcing with spikes driven only part way into the plank floor.

Close inspection after the pavement had been in service revealed the new deck to be in excellent condition. The improvement was planned in the office of the Chief Engineer of the Great Northern Railroad, with H. S. Loefler, Bridge Engineer, in charge.


41'-2" Center to Center of girder
20'-7"
1'-7"
38'-0" Clear roadway
℄ of bridge
Gas pipe drains 3"ϕx1'-3"lg. to be placed where required and to discharge outside of track rails and structural steel members.
4" Concrete slab 1:2:3 mixture - strength to be not less than 3000 lb. per sq. in.
Longitudinal reinf. ⅜"ϕ bars - 12" o.c.
Transverse reinf. ⅜"ϕ bars - 6" o.c.
4"x12" Sub plank, creosoted, placed 1911
⅜"ϕx7" wire spikes
⅜"ϕx10" Wire spikes-5' o.c.
B
B
2'-6"
2'-6"
8¼"
1'-3½"
SECTION B-B
6x14" Joists creosoted
8' c. to c. fl. beams

Typical Cross Section of the University Avenue S. E. Bridge Over the Great Northern Tracks in Minneapolis

A New Type of Air Hose

Hipress air hose, a new product designed for all types of air tool applications, has recently been announced by the B. F. Goodrich Co., Akron, Ohio. This hose is of combination construction made in long lengths.

The inner carcass consists of four plies of specially woven duck and the outer carcass is a tight braid of high tensile cords which are applied with a tension ten times that normally used on long-length braided hose, according to the manufacturer. Between the inner and outer carcass is a substantial insulation which serves as a secondary tube to seal off penetration of air through the walls of the hose and to cushion blows from the outside.

The wrapped construction of the inner carcass is designed to provide a backing for the tube, due to the fine weave of the fabric which is particularly valuable when the tube is subjected to softening from internal heat. Due to the bias design of the wrapped fabric, any air or fluid which reaches it travels only a short distance before reaching the terminal point of the yarn, thus preventing penetration throughout the entire length of hose.

The tube is made of a special rubber capable of resisting both oil and heat. The rubber cover of the hose is compounded to withstand abrasion.

Hipress air hose is furnished in three sizes, ½, ¾ and 1-inch, and is available in 500-foot lengths.

CONCRETE VIBRATORS

Air operated vibrators for all classes of concrete construction including Bridge deck slabs, Dams and Locks. Highway pavement and Concrete products.

Write for circulars and engineering data.

MUNSELL CONCRETE VIBRATORS

997 West Side Ave. Jersey City, N. J.

over 40 AUSTIN-WESTERN 5 yard scrapers in operation already!

● Get the facts. This new 5-yard scraper is low in first cost—$2,400.00 f. o. b. Aurora, including power takeoff and winch!

It moves more dirt per drawbar horsepower than any other scraper its size—handles easily with a 35 h. p. tractor in normal digging; 50 to 60 h. p. for gumbo and other hard going.

A single cable controls every operation. Digging, the pan is level with the ground—carrying, plenty of clearance—dumping, spreads as it dumps with tractor in high gear.

Cuts 6 feet wide, 6 inches deep, and dumps to any depth up to 9 inches. Single cable control cuts maintenance costs, simplifies operation.

Write for complete details of yardage figures—cost of operation on the job.

The coupon brings you the whole story.

The Austin-Western Road Machinery Co.
Home Office: Aurora, Ill. Cable Address: AWCO, Aurora, Ill.
Branches and Warehouses in Principal Cities

Austin-Western

ROAD GRADERS · MOTOR GRADERS · ELEVATING GRADERS · DRAGS
ROAD ROLLERS · DUMP WAGONS · DUMP CARS
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CRUSHING AND WASHING PLANTS · SWEEPERS AND SPRINKLERS · SHOVELS · CRANES · ETC · SNOW PLOWS

The Austin-Western Road Machinery Co.
Y, Aurora, Illinois
Send me production and mechanical details on the 5-yard Scraper.
Name.....
Address..... 646
City..... State.....

A. I. S. C. Bridge Awards

The North Grand Island Bridge at Niagara Falls, N.Y.; the Lorain Road Bridge at Cleveland, Ohio, and the Mortimer E. Cooley Bridge over the Manistee River near Wellston, Mich., have been judged the most beautiful bridges built during the past year and received the annual award of the American Institute of Steel Construction.

These selections are made annually, the nominations being divided into three groups. The North Grand Island Bridge, winner in Group A which includes bridges costing $1,000,000 or more, extends from Niagara Falls, N.Y., over the Niagara River to Buckhorn Island at the north end of Grand Island, N.Y. This bridge is owned by the Niagara Frontier Bridge Commission, was designed by Waddell & Hardesty and George C. Diehl, Inc., and was fabricated by Jones & Laughlin Steel Corp. in conjunction with the Fort Pitt Bridge Works. It was built under the direction of Frederick S. Green, Chief Engineer of the Niagara Frontier Bridge Commission and Superintendent of Public Works of the State of New York. Honorable mention in this group went to the Sagamore Bridge across the Cape Cod Canal in Massachusetts, which was designed by Fay, Spofford & Thorndike and fabricated by the American Bridge Co. for the Corps of Engineers, U. S. Army.

Group B includes bridges costing between $250,000 and $1,000,000. First place in this group went to the Lorain Road Bridge across Rocky River Valley, located in Cleveland and in the Village of Fairview, Ohio. The bridge was designed and erected under the direction of the Ohio Department of Highways, John Jaster, Jr., Director; J. R. Burkey, Chief Engineer, Bureau of Bridges; W. H. Rabe, Chief Designing Engineer; and D. H. Overman, Principal Designing Engineer; and was fabricated by Fort Pitt Bridge Works. Honorable mention went to the Tower Bridge over the Sacramento River between Sacramento and Yolo Counties, California. This bridge, the design for which was prepared under the direction of C. H. Purcell, State Highway Engineer, and F. W. Panhorst, Acting Bridge Engineer, was fabricated by the Consolidated Steel Corp., Ltd., for the State of California.

The Mortimer E. Cooley Bridge near Wellston, Mich., winner of the third group of structures costing less than $250,000, is a State Highway Department structure, designed by L. W. Millard, State Highway Bridge Engineer, and fabricated by Wisconsin Bridge & Iron Co. Honorable mention in this group went to a Missouri State Highway Department structure, the Tamm Avenue Separation in St. Louis, Mo., designed by N. R. Sack, State Highway Bridge Engineer, and constructed by the Stupp Bros. Bridge & Iron Co., under the direction of T. H. Cutler, Chief Engineer of the Missouri State Highway Department.

The jury consisted of Robert D. Kohn and Arthur Loomis Harmon, architects of New York; Professor William J. Krefeld, College of Engineering, Columbia University; Howard C. Baird, Consulting Engineer of New York; and Kenneth Hayes Miller, artist, of New York.

Highway Lights Installed Near Construction Job

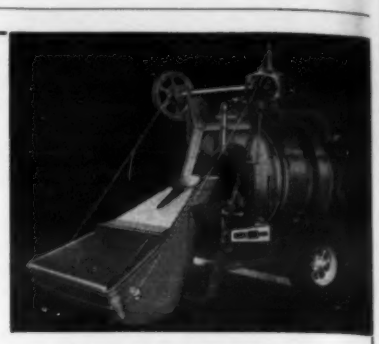
Recognizing that construction under way at the intersection of the old and new highways south of the Victory Bridge approach at South Amboy, N. J., would add to the danger of night driving, E. D. Sterner, Safety Highway Commissioner of New Jersey, installed nine highway lights near the work.

The lamps, of a new type recently announced by General Electric which double the light output on the roadway given by conventional units, are spaced 300 feet apart and are mounted at 25-foot height on one side of Route 4. The temporary lighting is between two permanently lighted areas, one the lighted Victory Bridge approach on the north, and on the south, the lighted streets of the City of South Amboy.

CMC's NEW TWO WHEELERS

Fastest mixing—easiest handling—one and two-baggers in the field. Choice of pneumatic, dual, solid rubber-tired or steel wheels. Spring cushioned—perfectly balanced for "high ball" trailing.

Get bulletin on these new models or other MASTERS and WONDERS from one-half bag to one yard capacity.



CONSTRUCTION MACHINERY CO.
WATERLOO, IOWA

LANSING 3½-T MIXER

FOR FAST TRAILING FAST MIXING

Large mixing drum, Hyatt roller bearing wheels. Wide-tread rubber wheels and spring shock-absorbers. Alemite fittings. Lauson 2 h.p. gasoline engine. WRITE—for specifications and current prices.

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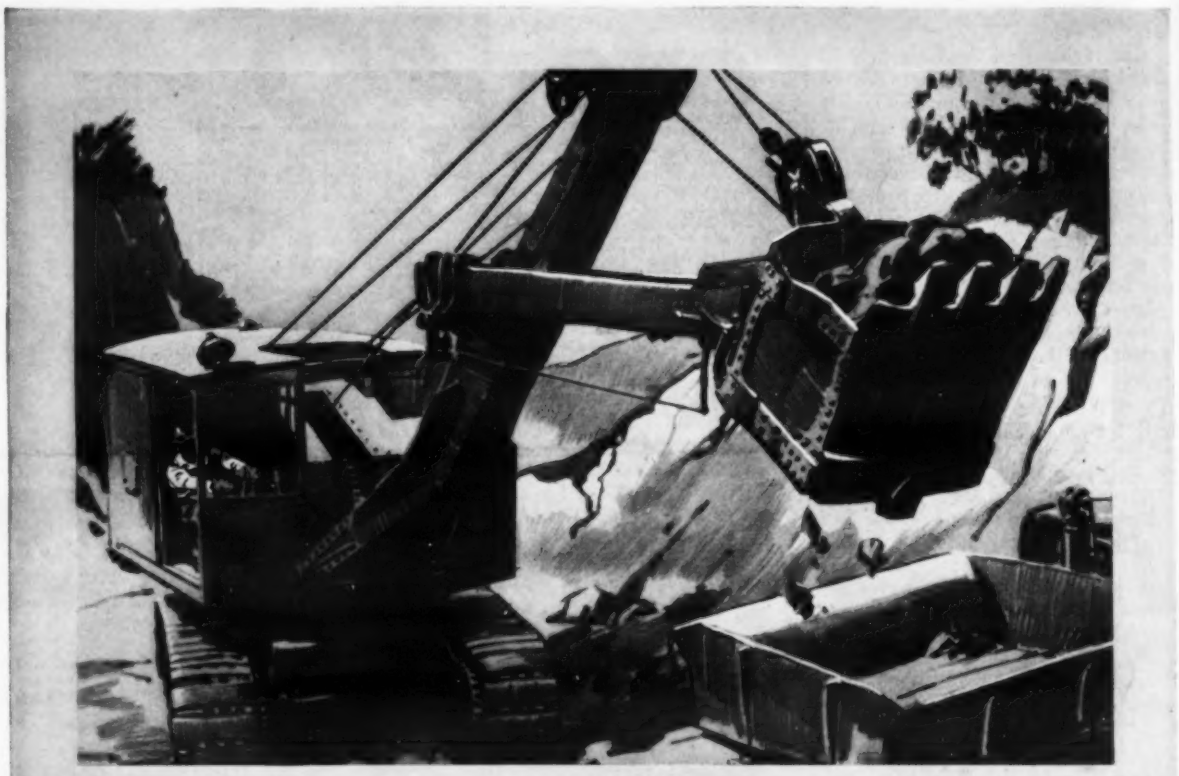
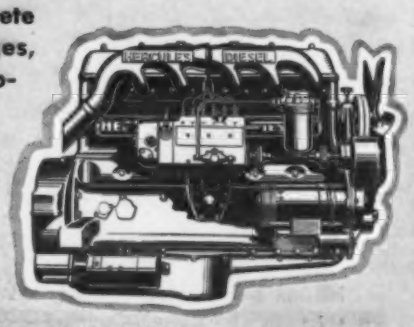


HERCULES ENGINES

GOVERNMENT SERVICE—Hundreds of Hercules Engines, gasoline and Diesel, are in Government service, both state and federal. They provide dependable power for shovels, tractors, concrete mixers, ditchers, dredges, pumps and industrial locomotives, road scrapers and scarifiers and heavy-duty trucks—all used on state and federal projects from Maine to California. Hercules Engines have long been used in every type of modern heavy-duty machinery. The United States Government, in selecting Hercules-powered equipment, has the assurance of over twenty years of experience—devoted solely to building heavy-duty power plants. The long experience of the Hercules organization in designing and producing heavy-duty engines is available to all manufacturers in planning any type of application.



HERCULES MOTORS CORPORATION, Canton, Ohio
America's Foremost Engine Manufacturer • Power Plants from 4 to 200 H. P.

The New Insley Type K Excavator

New 3/8-Yard Convertible Full-Revolving Excavator

The Type K excavator, recently announced by the Insley Manufacturing Co., 801 North Olney St., Indianapolis, Ind., is a ⅜-yard full-revolving unit, offered with interchangeable attachments as a shovel, trench hoe, dragline, clamshell crane, and crane for hook work, together with a 10-ton trailer for convenience in local transportation.

Among the features of this new excavator is the Insley patented crowd, providing fast operation with a close control of the dipper. The shovel boom is a solidly welded single piece box section while the dipper stick is a two-piece pipe structure which rides the saddle block astraddle the boom and is securely connected at its lower end to the dipper. The dipper is flat bottomed, with Insley cast steel combination tooth and cutting edge, leaving a level floor in the excavation.

The trench hoe uses the same boom as the shovel attachment so that they are readily interchangeable in the field. The dipper is of ⅜-yard capacity of all welded construction with the combination tooth and cutting edge on the bottom and on the corners.

The standard boom for the dragline, clamshell and crane for hook work is 25 feet long, built up of latticed channel sections. The power boom hoist, which is driven from the reversing shaft by means of a sliding intermediate gear, will raise or lower the boom under load and is automatically locked in position by a spring-loaded anti-backing brake.

The dragline bucket, also of ⅜-yard capacity, is solidly-built, reinforced and balanced. The heavy alloy cast-steel teeth are double heat-treated, providing ample strength and wearing quality for hard digging.

The carbody and turntable is an integral unit of structural steel sections and plates electric-welded throughout, providing strength with minimum dead weight. An outside pinion on the revolving platform meshes with the swinger gear on the carbody, thereby transmitting both power and sensitive control. The center guide pin takes only the horizontal thrust of the attachment. The vertical reactions of the operation are carried entirely on the rollers. The center guide pin serves as a housing for the vertical propeller shaft and for the crawler controls. The vertical propeller shaft carries on its lower end a bevel gear which engages the gear on the cross propeller shaft which, in turn, drives either or both crawlers through the independently controlled jaw clutches sliding on the splines at the shaft ends.

Each crawler is operated independently for movement in either direction by means of controls extending down through the hollow vertical propeller shaft. To lock the machine for digging, the clutches are disengaged and the brakes are set with a single backward pull on the steering levers. To move the machine in any direction, one or both of the brakes are first released and then either or both of the clutches are engaged. Each clutch has behind it a strong spring to cause it to snap into engagement.

The crawlers are of the Insley self-cleaning type with six double rollers running on the high track surface of the shoes and guided by the center lugs of the shoes. The track-roller shafts are in outside boxes sealed against dirt and are equipped with fittings for grease gun lubrication. Crawler shoes for standard equipment are 11 inches wide made with heat-treated cast alloy steel.

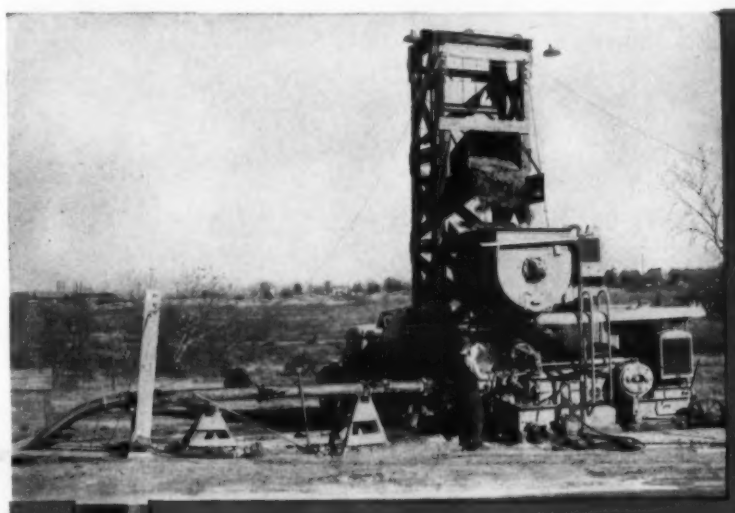
A Buda 6-cylinder gasoline motor, developing 40 hp at 1,600 rpm, with electric generator, starter and battery, furnishes the power for this machine. Diesel power is available on special order.

Road Rolling Important in Manchukuo

Although its methods are unusual, the Province of Manchukuo uses the most modern equipment in its road building and maintenance program, according to a story in a recent issue of *Roads and Road Construction* of London. Caterpillar crawler tractors and elevating graders play an important part in this road development, but the tractor's chief duty is road rolling.

Rolling a highway is deemed the most essential part of the Manchurian formula. Earth and rock are spread by elevating grader or by "coolie-power" and are compacted by a giant home-made roller of heavy boiler plate filled with concrete, and equipped with a tongue on each side to eliminate the necessity of turning around on the narrow roads. The roller is 4½ feet high, 5 feet wide and weighs 6 long tons (13,440 pounds). Its cost, 600 yen, is comparatively high for this type of equipment.

After the earth is cast up by an elevating grader to form a raised road, a blade grader follows to top off the windrow. And then comes the road roller. This juggernaut is pulled by a tractor and many miles a day are covered by the outfit. The roads, although narrow and often lined with boulders, have almost billiard table smoothness, according to the report from London.



Tunnels- All Sizes- The MODERN WAY- Pump them with Rex Pumpcrete

● Three Rex Pumpcretes are the major units of 3 plants that are placing the concrete in tunnels of 4 sizes, from 3' 6" x 6' to 9' 6" x 9' 6", that make up the Minneapolis interceptor sewer system.

The Rex Pumpcrete already had pumped tunnel linings at Boulder Dam, Colorado River Aqueduct, Baltimore, New York and Chicago. But one of the deciding factors in its selection for the Minneapolis Project was that it represented the only system that provided satisfactory means for mechanical placing of the concrete in the tunnel of smallest section, 3' 6" by 6'.

Through well-drill holes the pipeline extends down 60 to 85 feet. In the tunnels, the concrete is then pumped a maximum of 800 feet in each direction.

Sixty-foot arch forms are carried on travelers, and normal progress is one 60-foot form per day for each pump. Two five-hour shifts are employed; one, stripping, moving and resetting forms; the other, placing 60 feet of invert, side wall and arch. All concrete is pumped to position with the Rex Pumpcrete.

A new engineering report on "The Rex Pumpcrete for Tunnel Lining" is in preparation by Professor E. D. Roberts†, Professor of Civil Engineering, Marquette University. The Chain Belt Company will be glad to place its contents before any contractor, engineer or public official interested.

The Rex Pumpcrete on the surface is charged by a skip hoist from Moto-Mixers.

The pipeline in the tunnel extending into the top of the forms. Compressed air also assists in the final placing through the pipeline.

† Author of "Concrete Tunnel Lining Pumped Down Drilled Holes." ENGINEERING NEWS RECORD, June 11, 1936, page 839.

CHAIN BELT COMPANY
1666 West Bruce Street, Milwaukee, Wis.

WON'T QUIT
or cause time out

A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

●

The Hayward Company
32-36 Dey Street
New York, N.Y.

Hayward Buckets

Penna. County Road Dept. Well-Organized

(Continued from page 1)

Use of Local Material

Since, in most sections of the county, native stone is plentiful in the form of stone rows in fields and since the Federal authorities through the CWA and WPA have been furnishing all labor, much use has been made of native stone as a base course having depths of 8, 9, 10 and 12 inches, hand napped to a 4¼ or 5-inch size, rolled and choked with bank-run sand and gravel. The choking material is then rolled and additional bank-run material spread over the base course until the voids are completely filled, after which the road is opened for traffic until ready for priming. The excess materials are then swept from the base and a tar primer is applied at the rate of about 0.60-gallon per square yard in two applications, the first application being about 0.35-gallon and the second about 0.25-gallon per square yard, the last application being lightly covered with sand at the rate of 10 pounds per square yard.

This treatment is followed, in a week or two, by a double surface treatment of naphtha cut-back asphalt cement and crushed stone, the first application being about 0.30-gallon per square yard covered with about 30 pounds of ¾-inch chips and the second application of 0.25-gallon covered by about 23 pounds of ½-inch chips. In both applications use is made of multiple blade and broom drags followed by 10-ton rollers. After the final rolling a fan coat or seal coat is applied at the rate of 0.15-gallon per square yard.

All roads constructed in this manner have 18-foot roadways and 5-foot shoulders, superelevated and widened on all curves. These roads are laid out whenever possible to provide a clear sight distance of at least 300 feet on horizontal and vertical curves.

In the case of earth roads, as soon as the weather permits, the roads are shaped with tractors and graders and rolled, then given an application of dust-laying oil at the rate of about 0.35-gallon per square yard.

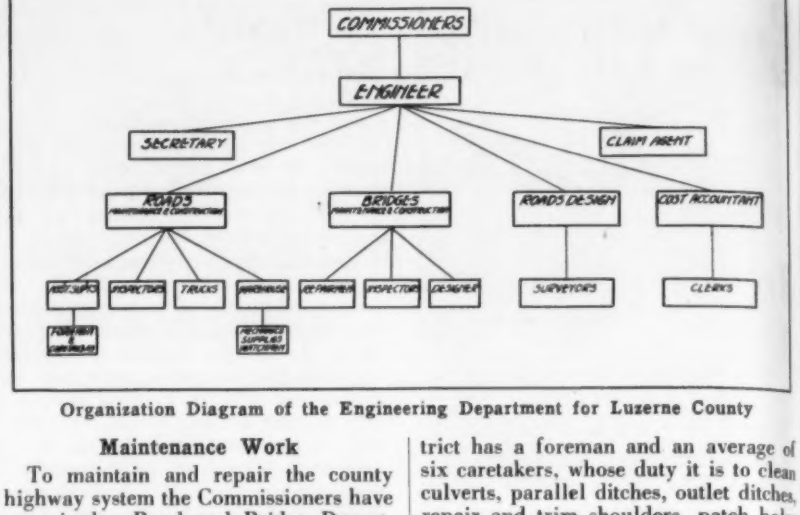
Contracts for Work and Material

The bituminous materials and the crushed stone are furnished and applied by contract. Each spring, bids are received and contracts awarded for the furnishing and applying of various types of bituminous materials and also for the furnishing and applying of the various sizes of crushed stone. The contracts are in force for a period of one year. The county, however, furnishes and operates the rollers and drags. The same arrangement is used in retreatment work.

Once a year bids are received and contracts awarded for furnishing and delivering road oils, cold patch, crushed stone, sand, pipe, guard rail cable and posts, bridge plank, cement, motor oils and other materials necessary for the maintenance of roads and bridges. All of the contracts are in force for a period of one year.

Bridges

The majority of small bridges constructed by the county during the last fifteen years have been built of reinforced concrete, the concrete proportions being determined by a strength specification, using Abram's theory of the fineness modulus and water-cement ratio. Most of the new concrete structures, and many extensions required to furnish wider roadways on old concrete and stone bridges, have been designed as rigid frames.



Organization Diagram of the Engineering Department for Luzerne County

Maintenance Work

To maintain and repair the county highway system the Commissioners have organized a Road and Bridge Department. The county has been divided into five maintenance districts. Each district has a foreman and an average of six caretakers, whose duty it is to clean culverts, parallel ditches, outlet ditches, repair and trim shoulders, patch holes in the pavement, and assist in re-treat-

(Continued on page 27)

WRITE FOR CIRCULAR
on the
South Bend
MODEL 200
BITUMINOUS MATERIAL DISTRIBUTOR
—Applies 1/10 to 3 gallons per square yard
—Distributes any width up to 22 feet
—Has a rated capacity of 300 to 2000 gallons
—Can be mounted on any truck or trailer

MUNICIPAL SUPPLY COMPANY
SOUTH BEND INDIANA

Minnehaha Avenue, Minneapolis, Minnesota. Tarvia-built in 1920, and as attractive, easy-riding and skid-safe today as it was sixteen years ago.

Since the first Tarvia road was built more than thirty years ago, highway engineers and Tarvia field men have worked together. The result is that today each Tarvia man has at his disposal an unmatched fund of road-building knowledge accumulated from reports and records from all parts of the country. He will gladly extend to you the opportunity to share in this background of sound, practical highway experience. 'Phone, wire or write our nearest office.

THE TECHNICAL SERVICE BUREAU of The Barrett Company invites your consultation with its technically trained staff, without cost or obligation. Address The Technical Service Bureau, The Barrett Company, 40 Rector Street, New York.

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Concrete Plant Layout at Pickwick Dam, Tenn.

Belt Conveyors Move Aggregate from Storage to Large Mixing Plant with Power Controls

By ROBERT F. OLDS,
Construction Engineer

(Photo on page 44)

A NUMBER of high dams for flood control and improvement of navigation are included in the program of the Tennessee Valley Authority. Pickwick Landing Dam is the third of these structures to be undertaken.

Active construction on this dam was begun early in the spring of 1935 and it will be completed early in 1939. It is located on the Tennessee River about 6 miles north of the Mississippi-Tennessee State line, 53 miles downstream from Wilson Dam at Muscle Shoals, and 207 miles upstream from Paducah, Kentucky. At the dam site the river runs nearly west, its normal width is about 1,200 feet, the banks are 40 to 45 feet high, and there is a large flood plain on each side of the river extending to higher ground. The whole valley floor is a limestone formation which affords a good foundation for the concrete structures. The rock is about 20 feet below normal low water in the river.

The Pickwick Dam Project includes an earth embankment on the south side 4,700 feet long, a navigation lock at the south bank of the river 110 feet wide by 600 feet long, a spillway dam 1,155 feet long across the river, a non-overflow section at the north bank 767 feet long, and an earth embankment on the north side 890 feet long. The total length of the dam will be 7,715 feet. On the downstream side of the non-overflow section a power house will be installed.

Plan of Work

The principal items of work in the project are 3,800,000 cubic yards of excavation, 3,400,000 cubic yards of embankment, and 610,000 cubic yards of concrete. The construction schedule was laid out to cover about three and one-half years and at the present time about one-half the excavation and embankment have been completed and 250,000 cubic yards of concrete have been placed.

The quantity of concrete to be placed warranted a very careful study to determine the source of aggregate and the type and arrangement of the plant. The concrete program is divided into three stages and the concrete must be delivered over a large area. The total of 610,000 cubic yards is divided into three parts, 290,000 cubic yards in the lock at the south bank of the river, 155,000 cubic yards in the intake and north end of the dam at the north bank of the river, and 165,000 cubic yards in the spillway dam in the river channel.

The construction schedule is divided into three stages: Stage I includes the concrete in the lock structures and is now in progress; Stage II includes the concrete on the north side of the river and covers the non-overflow section of the dam, power house, and retaining walls; Stage III includes the concrete in the river or middle section of the dam.

The map shows the relative location of the several parts of the plant, the central mixing plant is located just south of the lock structures and delivers concrete into the lock by a belt conveyor to a track hopper. For Stages II and III the concrete will be handled on a belt conveyor to a hopper, to the cableway bucket and the cableway will deliver the concrete to track hoppers inside the cofferdam for Stages II and III of the construction program.

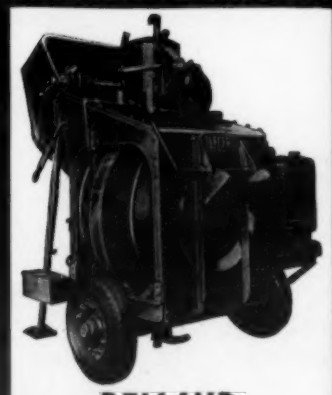
Handling Materials

It was decided that one central mixing plant with a large stockpile for aggregate would be the most economical method. The large stockpile is necessary because the aggregates are obtained from the river by dredging and a much better price could be obtained if the contractor for this material could work his equipment to capacity when river conditions were favorable and could complete his contract in September, 1937; consequently, storage was provided for 250,000 tons of aggregates.

The cement silo and aggregate storage area are located at a relatively long distance from the mixing plant in order that they may be close to the unloading dock. The aggregates are handled on belt conveyors and the cement is handled by a pneumatic conveyor to the mixing plant.

(Continued on page 25)

BUYING A MIXER?



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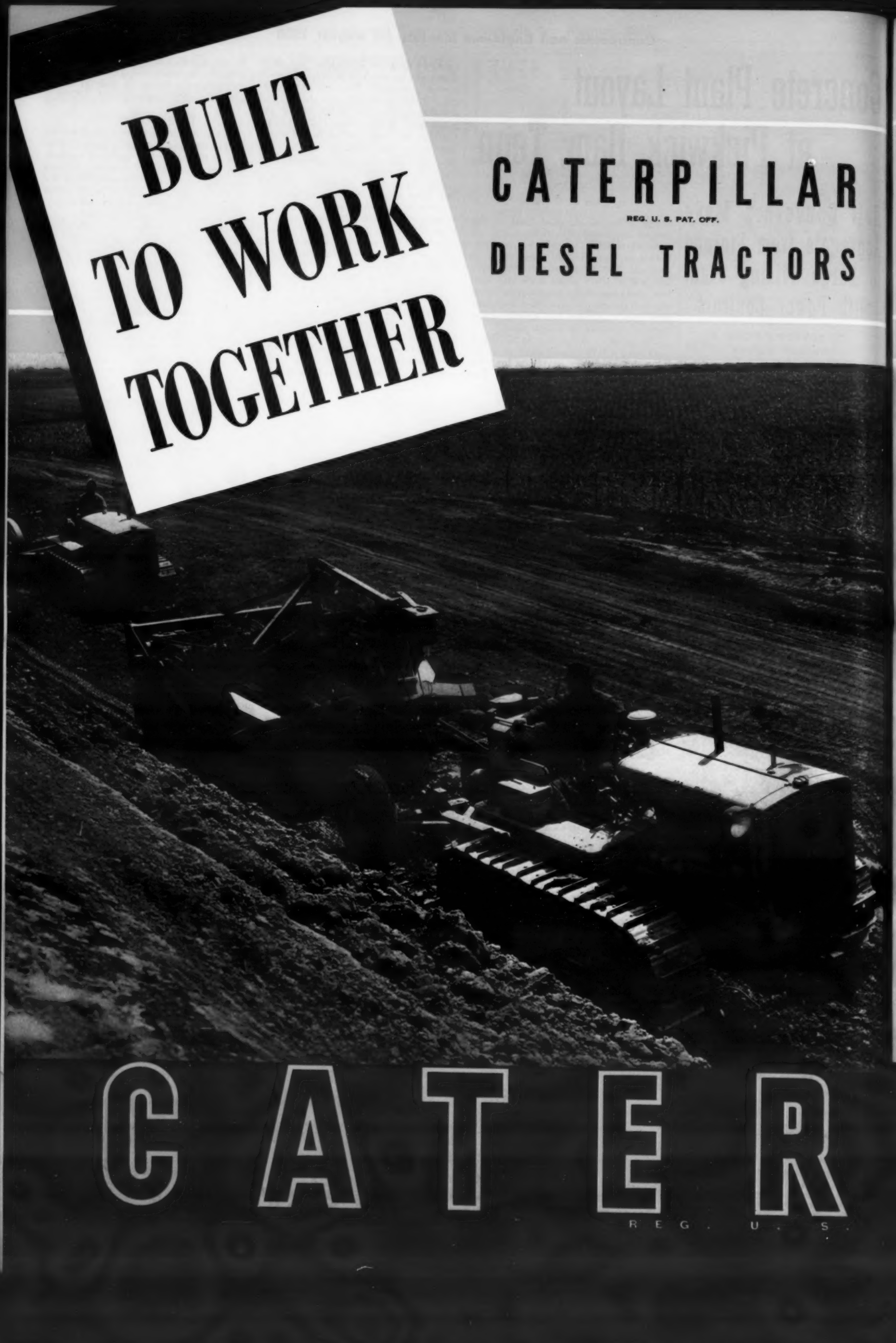
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Gentlemen:

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PILLAR

PAT. OFF.

A Close-Up of the Flex-Plane Finishing Machine at Work on a Concrete Floor. Note the De-Airing Screeding Attachment on the Front of the Standard Screed

Road Paving Methods Used on Factory Floor

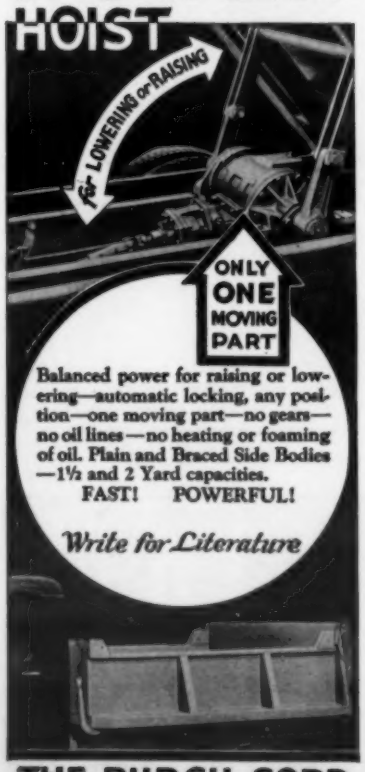
Road building methods were applied to the construction of a reinforced concrete floor laid in the plant of the Heller-Murray Co., in Youngstown, Ohio. There were four 18-foot concrete slabs and one 15-foot slab. Heltzel steel road forms were used. The slab was of 5-inch uniform thickness, reinforced with steel mesh. A poured longitudinal joint was installed in the center of each slab and a transverse contraction joint every 20 feet. Four and two-fifths gallons of water was used for each sack of the cement. The concrete was vibrated.

A Flex-Plane finishing machine, equipped with a de-airing screeding attachment on the front of the standard screed with a flexible hose running to the vacuum pump, ran on the steel forms. Immediately behind the de-airing screed was the Flex-Plane mechanical vibrated screed which was equipped for both forward and backward screeding. The machine was adjustable for handling both the 15 and 18-foot slabs.

Simplified Practice R1-36 Approved by Industry

The revision of Simplified Practice Recommendation R1-36, vitrified paving brick, proposed last April, has been approved by the industry and became effective on June 30. Copies of the revised schedule may be secured from the Division of Simplified Practice, National Bureau of Standards, Washington, D. C.

The BURCH
BALANCED POWER HOIST



Balanced power for raising or lowering—automatic locking, any position—one moving part—no gears—no oil lines—no heating or foaming of oil. Plain and Braced Side Bodies —1½ and 2 Yard capacities.
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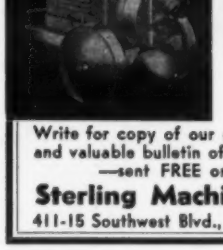
The Story of Ten Diesels

When the 10,000th Caterpillar diesel engine left the assembly line last November, it was decided to find out what had happened to No. 1, No. 1,000 and so on. The idea, which required some ingenious sleuthing in some cases, has taken the form of an attractive booklet entitled "The Story of Ten Caterpillar Diesels."

Old No. 1, built in October 1931, is owned by Harms Brothers, contractors of Sacramento, Calif., for whom it is still doing duty. No. 1,000 was found on a ranch, No. 2,000 is driving a generator in a factory, No. 3,000 is powering a tractor on a variety of construction jobs for Frederickson & Watson of Oakland, Calif., and No. 4,000 is powering a tandem-drive Auto Patrol grader on county work in Washington.

The company's sleuths had to don pith helmets to locate No. 5,000 which with thirty-seven other Caterpillar tractors is working in the jungles of northern Venezuela, clearing land and building trails through dense tropical growth, preparing the way for the opening up of an oil field.

They were all located, each at its respective task, and the story of these diesels and the work they have done is to be found in detail in the above-mentioned booklet, copies of which may be secured from the Caterpillar Tractor Co., Peoria, Ill., by mentioning CONTRACTORS AND ENGINEERS MONTHLY.



Dependable 2" to 8" Self-Priming PUMPS
The choice of Contractors from coast to coast
Write for copy of our combined catalog and valuable bulletin of engineering data —sent FREE on request.
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CLEVELAND WDA-10 DOING ITS PART ON A BIG JOB

THE Waldo approach to the Golden Gate Bridge, now being built through the hills of Marin County by Macco Construction Company, is one of the largest cut-and-fill jobs on record in the State of California. Connecting San Francisco, by way of this magnificent bridge, now nearing completion, with the Redwood Highway to the north, the full importance of the Waldo Approach Road will not be realized by the public till traffic begins to flow over this essential new connecting link.

A really big job it is—and Cleveland is proud of the selection of the WDA-10 for such service. The ground is shattered and loose, but many formations are too hard for the shovels to handle without blasting. It is tough drilling, with this loose stuff falling in behind the bits—but the Cleveland is built for tough conditions. Its powerful hole-blowing device and strong rotation carry the drill bits through and leave clean holes the full depth.

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LEADERS IN DRILLING EQUIPMENT

Giant Timber Crib at Grand Coulee

By HENRY W. YOUNG

(Photo on page 44)

ANOTHER "biggest ever" feature in connection with the work of Mason-Walsh-Atkinson-Kier Co., at Grand Coulee Dam is the pair of timber cribs for blocks 39 and 40.

Inside the present cofferdam, concrete block 40 has been poured to contract height. In order to divert through the area of the west side cofferdam, where blocks are now being poured and where channels will be left for diversion purposes by leaving alternate rows of blocks poured to less than full height, it became necessary to block off the bucket section of block 40 by means of timber cribs. Then, when the time arrives, the central portion of the old cofferdam may be removed east of block 40 and excavation and concreting operations started in that area, which is to be the spillway.

The first part of the timber work, in block 40, rests on the bucket section of the block and is carried over to the higher portion of the block at the right, which has already been poured. On the opposite end it connects with the diversion cells. This portion of the crib work in block 40 starts at Elev. 870 and is built up to Elev. 950, or 80 feet. In reality, it acts as a support for the main part of the crib, which will be built up in block 39, overlap the high portion of block 40 and be carried up to Elev. 1,000, or 130 feet.

The completed crib will be 200 feet long and the width overall will be 100 feet. For its construction, 3,000,000 board feet of timber will be required. The timbers range from 12x24 inches at the bottom to 12x12 inches at the top. It is built in pockets 10 feet x 10 feet in cross section, which are filled with run-of-bank gravel brought over from the east side on the conveyor used for excavating the east side area and crossing on the up-stream conveyor trestle.

The bottom timbers of the crib are seated on a floor on top of the concreted bucket section, and all timbers are fastened together by vertical drift bolts. Since the pressure of the material in the pockets will be very great at such heights, it will tend to burst the pockets. Therefore, a method of reinforcing has been resorted to. On the projecting ends of the diaphragm timbers, wood scab plates 4 inches thick and the width of the timber have been bolted top and bottom. This reinforcement has been made still more effective by cutting circular grooves in the adjoining surfaces, which match in position, and inserting a metal split ring in the grooves, half in the timber and half in the scab. This ring is 4 inches in diameter and the metal is 3/16-inch thick. Starting at the bottom of the crib, there are four 1-inch bolts and eight rings to each end of the timber. In the upper portions there are two bolts and four rings. Grooves for the rings are cut with a special grooving tool operated by the usual form of boring machine.

Right, R. L. Telford, Cofferdam Superintendent, Holds One of the Split Rings; Center, W. S. Butler, Day Shift Superintendent; Left, Dave Stewart, Foreman of Crib Construction, Holds a Special Grooving Tool. The Top Scab Plate Bolted to a Diaphragm Timber Is Also Shown.

Socony-Vacuum Appoints Lubricant Distributor

The appointment of the General Petroleum Corp., of California as exclusive distributor in its territory for Gargoyle industrial lubricants has been announced by the Lubrication Department of the Socony-Vacuum Oil Co., 26 Broadway, New York City. The General Petroleum Corp. is the Pacific Coast subsidiary of Socony-Vacuum.

This appointment makes available to users of lubricants in California, Oregon, Washington, Arizona, Nevada and Alaska the counsel and advisory service of Socony-Vacuum engineers.

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Now available in 2, 5 and 15-Ton Sizes. For capacity comparison, ⅜" cable used:

2-Ton "Lightweight" ..... 75 ft.
5-Ton "General Utility"..... 250 ft.
15-Ton Triple-Geared "Special".....1200 ft.

With patent gear change and positive internal brake that never fails, and will lock load.

Gear Ratios	Weight	Price
2-Ton 4 & 22 to 1.....	60 lb.	$50
5-Ton 4 & 24 to 1.....	110 lb.	$75
15-Ton 4, 19 & 109 to 1.....	680 lb.	$200

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Dealers principal cities—5-Ton stocked and priced F. O. B. Chicago, Brooklyn, Houston and Seattle.

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NOT a Trick Shovel

NO. SIR! Quick-Way is a scientifically-balanced, specifically - designed, LIGHT - weight, HEAVY-duty power shovel made for mounting on any 3½ to 5-ton truck. Once mounted there's no need to ever unmount it. It is the true answer to the Construction Industry's long felt desire for a light weight power shovel that will stand the gaff of heavy duty work and produce real yardage.

Quick-Way is NOT a compromise. After 16 years pioneering construction, we know that you can't compromise when you build a truck shovel! The crawler one day, truck shovel the next—the single power-unit machine—or pig iron counter-balancing on a shovel that is much too heavy for a truck in the first place—are all compromises and bound to be inefficient.

Watch a Quick-Way on a job. Only then can you realize the tremendous difference proper construction makes—every essential part as large as the heavier shovels, but all unnecessary weight eliminated—the Quick-Way does every job, and does it right—just start the truck and you're on your way, ready for the toughest jobs, on mountains or at sea level.

Write to any Quick-Way owner (names gladly furnished on request); ask them what they think of Quick-Way. They'll tell you that the Quick-Way Truck Shovel is 100 per cent. Then you'll believe us when we say—it's the only thoroughly tested, thoroughly proved truck shovel—in fact, the only truck shovel on the market!

Your nearest dealer will gladly furnish further information and literature and arrange for a demonstration when there's a Quick-Way in your territory. Write today.

THE QUICK-WAY TRUCK SHOVEL COMPANY

42nd and Josephine Sts. Denver, Colorado

New Longitudinal Float Mechanically-Operated

A new mechanical longitudinal float, designed to eliminate the fatigue and accompanying poor results of bull float operators after they have been hauling the float for half a day, has just been put on the market by the Koehring Co., 3026 West Concordia Ave., Milwaukee, Wis.

Riding the forms, this new longitudinal finisher is mounted on single wheels forward on each side and two wheels on each axle in the rear to iron out any irregularities. Further insurance of smooth riding is furnished by the scrapers to clear the forms of concrete ahead of each pair of rear wheels, and by the 14-foot wheel base. The machine is adjustable to widths from 8 to 22 feet 6 inches by screws which slide the wheels in or out on a 2½-inch shaft. This feature can be used effectively for finishing a widened curve.

The machine is operated by a Wisconsin motor through two transmissions, one for the forward movement of the machine and the other for the carriage of the longitudinal finisher. Chains give positive movement to the carriage while the screed is oscillated by a single channel bar running the full width of the machine and moved by eccentrics. The channel oscillates the screed by two pins on the screed. There is an automatic shift to reverse the side to side movement

C. & K. M. Photo

The New Koehring Longitudinal Finisher on a Concrete Road Job in Indiana

of the screed by means of a lug on the chain. The machine can be stopped at any moment by the operator who rides the narrow platform on the screed carriage, by pushing on a continuous bar which runs the full width of the machine and which has lugs so that the operator can reach over with any tool and push the nearest lug.

The 12-foot screed is 10 inches wide and is made of steel and loaded with concrete to weigh 710 pounds. It is slightly rounded at the ends to enable it to ride the concrete smoothly and not dig in. It does not rest on the concrete as its plane of operation across the road is controlled accurately by a pair of tracks or templates which are adjustable to the crown of the road. The plane of its longitudinal motion is controlled by rollers. The screed may be lifted from the concrete by toggles actuated by a long lever on the screed carriage, and when it is let down its position is limited by an adjustable pin. The screed carries a considerable amount of material from side to side, and is thus able to deposit concrete in low spots. It can not dig in as its elevation is controlled by the templates. The weight of the screed is sufficient to enable it to cut off high spots in the surface. Instead of pushing the concrete over the forms at each pass and wasting it, the screed is lifted and carries the material back again. The entire machine advances 4½ feet while the screed is making one trip across the slab.

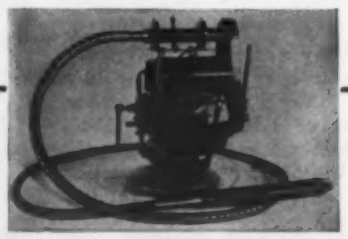
A similar machine was used by W. V. Vinton, a Wisconsin contractor, who built the machine himself last year for use on his own contracts in Indiana. Its success led to its commercial development, with some changes in design, and production by the Koehring Co.

Compact Motor-Driven Centrifugal Pumps

Designed for general service pumping where small space and low weight are required, the new Goulds motor-driven centrifugal pumps, recently announced by Goulds Pumps, Inc., Seneca Falls, N.Y., are available in standard and special constructions for the handling of ordinary and corrosive liquids. These pumps are made in capacity requirements from 5 to 1,600 gpm, with heads up to 280 feet. The combining of pump and motor in a single unit permits marked reduction in overall dimensions and weight.

Features of these new pumps are their substantial construction, the mounting of all moving parts on a single oversized shaft, running in heavy-duty ball bearings to eliminate friction and wear. The impellers are of the enclosed single suction type, mechanically and hydraulically balanced and are securely keyed and locked to the shaft. Casings may be swivelled to any of four positions and are fully equipped with priming and drain openings and air vent cocks.

Work on the 75-mile highway to connect the city of Ljubljana, Yugoslavia, with Susak will start as soon as the survey is completed. This highway, which will cost $2,270,000, will furnish a more direct connection between the northernmost Yugoslav Adriatic and its hinterland and will be of considerable economic importance to the surrounding area.



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AUGUST THIS YEAR STOP HAVE USED BOTH MACHINES WITHIN TWO
HUNDRED FIFTY MILES AREA WORKING ON PIPE LINE CELLARS
SWIMMING POOLS FLOOD CONTROL SMALL QUARRY STRIPPING LOADING
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For the past two years the Bucyrus-Erie 10-B has lead the sales record of ⅜-yard machines. 1936 will be another 10-B year. There are sound reasons why this outstandingly successful and widely copied machine continues to lead the field. Ask a Bucyrus-Erie representative!

BUCYRUS ERIE
EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN, U.S.A.

New Conn. T-Beam Bridge Eliminates Bad Curves

(Continued from page 1)

con reinforcing steel were used.

The falsework for the T-beam deck consisted of 12 x 12-inch sleepers placed across the concrete footing struts and pile butts, averaging 12 inches in diameter placed on 6-foot centers. Caps of 12 x 12-inch timber supported the 2 x 6-inch joists for the beam bottoms. Concrete for the superstructure was mixed in a Koehring 2-bag Dandie mixer and placed with a Stuebner drop-bottom bucket handled by the Northwest crane. The parapets and railings were then put in without difficulty, the mixer being set up on the deck.

Stone Facing

The stone facing for the abutments and wings was furnished by the Millstone Quarries of Niantic, Conn. The widths ranged from 22 inches for the bottom courses to 10 inches at the bridge seat. The depths were from 6 to 12 inches. After setting three courses of facing a back form was built for the abutment and the concrete backing placed. This procedure was repeated until the abutments were completed. A concrete cap 1 foot high and 15 inches wide was placed on all wings, and the bridge seats were capped with concrete. The facing stone was handled with a Universal truck crane.

Form lumber was all cut on the job with a portable saw rig powered with a LeRoi engine. The water supply for the mixers was secured by driving a 10-foot diameter ring of steel sheet piling, excavating to a depth of about 10 feet and then pumping the fresh water from this improvised well with a 2-inch portable Rex centrifugal pump.

Personnel

This project was begun in October, 1935, by the A. I. Savin Construction Co. of East Hartford, Conn., and was completed in May, 1936. Burl Wilder was Superintendent for the contractor. R. A. Bennett, who furnished the material for this article, was Inspector in Charge under L. H. Beebe, Resident Engineer for the Connecticut State Highway Department.

New Mgr. of Contractor Sales

Harry Schultz, formerly representative for the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill., in the Chicago territory, has been appointed Manager of Thor contractor tool sales for the entire country by that company.

The first shipment of sodium luminaires for about 15 miles of roadways for the double-deck spans, tunnel and aproaches of the San Francisco-Oakland Bay Bridge when it is completed, has been made by the General Electric Co.

Road Progress in Minnesota

More than $5,000,000 of road construction work has been completed by the Minnesota Highway Department by the middle of July and projects costing another $11,500,000 are in progress, according to a recent announcement by N. W. Elsberg, State Highway Commissioner.

The work completed or under way includes the following: 900 miles of grading; 600 miles of graveling; 125 miles of concrete paving; 102 bridge structures; 74 railroad crossing separations; and 41 railroad crossing electric signal installations. The remaining two-thirds of this year's program will be completed by fall.

The authorities of the Dominican Republic and Haiti propose to construct an international bridge between the two republics over the Artibonito River at Los Cacaos as part of the international highway to be constructed along the boundary between the two countries.

On long hauls tandem use of Le Tourneau 12-Yard Carryalls behind a single tractor increases yardage as much as 80%, reduces cost from 25% to 50%. Here an RD8 pulls loaded tandem rigs in high on a round-trip haul of 8,000 feet.

WHIP TOUGH CONDITIONS PROFITABLY

Le Tourneau owners, on job after job, meeting special conditions—rock-like shale, heavy muck, buckshot gumbo, deep sand, long hauls—have whipped those conditions with Le Tourneau equipment, saved the cost of moving in extra machinery, turned potential losses into real profits. Job-proved, the world over, Le Tourneau equipment can help you whip your earthmoving problems profitably.

Ask your "Caterpillar" tractor dealer to show you what Le Tourneau equipment is doing for owners near you.

British muck is always wet, always sticky, but this Le Tourneau 12-Yard Carryall, one of a fleet, moves good loads steadily and profitably at Chingford, England.

The rubbery gumbo of southern Illinois is tough to dig into and hard to unload. It comes up in rubber-like sheets, but is spread like any other material, evenly and quickly, by the Le Tourneau positive tailgate method of unloading.

(Left) Ordinarily this shale would have been blasted, then handled by truck and shovel, but Contractor Vogt of Ohio ripped it up with a Le Tourneau Rooter, moved it with Le Tourneau Carryall Scrapers.

R. G. LE TOURNEAU, INC.

Peoria, Illinois Stockton, California

Cable Address: "Bobletorno"

Manufacturers of: ANGLEDOZERS • BULLDOZERS • BUGGIES • CARRYALL SCRAPERS • CRANES • ROOTERS • DRAG SCRAPERS • POWER CONTROL UNITS • SEMI-TRAILERS.

LE TOURNEAU

The New L-B 93-OB Emulsion Sprayer

Emulsion Sprayers Have Many New Features

Emulsion sprayers for handling drum or packaged emulsions, light oils and tars have been made by Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio, for a number of years. But the 1936 line of these sprayers, built on an entirely new idea, has a number of features which are designed for safety, operating efficiency and ease of handling.

A channel iron running gear is used on both the No. 93-AM and the No. 93-OB. The main supply tanks are made longer, of smaller diameter, adding to the streamline appearance and making a stronger unit throughout. Pneumatic-tired Timken roller bearing wheels are semi-elliptic spring mounted on the chassis. The pressed steel hood over the air-cooled motor and compressor opens up when the unit is being used to give complete ventilation and free access to all parts. Closed, the hood is securely locked by one latch.

A new, exclusive safety feature is built into the No. 93-OB, for handling cut-back where heat is required. A simple but positive arrangement makes it impossible to operate the oil burner while pressure is being applied to the main tank, and by the same device it is impossible to apply pressure to the tank while the oil burner is burning. The heat flue in No. 93-OB is located at the extreme bottom of the supply tank.

Both No. 93-OB and No. 93-AM, the unit built to handle cold materials, fill themselves from the commercial drum. They are made in one and two-drum sizes. A strainer in the filling manhole and a siphon pipe drawoff prevent clogging of the lines. By simply turning on one valve, however, the operator can utilize the pressure in the main tank to blow out the lines, spray hose and nozzle. All fuel piping is of streamlined copper tubing and fittings. No. 93-AM is exactly the same unit as the No. 93-OB with the exception of burner, heat flue, and fuel tank and the necessary valves and piping.

To augment the line, an inexpensive hand pumped type of sprayer, the No. 93-AH, is also made. This unit uses the commercial drum as the pressure vessel and a hand pump.

Full information about these units, as well as the larger sprayer unit, the No. 101 Utility sprayer, will be found in Bulletin K-5 which may be secured from Littleford Bros., upon request.

Shoulder Maintenance on California Roads

There were many 15-foot concrete highways in California in the old days, or should we say the early days of highway construction. When the long distance busses became a popular mode of travel these heavy vehicles caused severe damage to the shoulders which had no particular heavy treatment and on which the busses were forced to travel because of the width of the road. This led to the immediate building up of the shoulders to stand the new traffic and a successful treatment has been in use for a number of years.

A slow curing road oil of 60 to 75 per cent asphalt has been applied on the natural soils at a rate of 1 gallon per square yard per inch of depth. This treatment is applied for a minimum width of 3 feet and up to 8 feet where necessary.

Where there is an adverse subgrade either an oil mix 4 inches thick or an equivalent depth of macadam is used. The macadam is primed with ¼ gallon of slow curing road oil, SC-1, followed by a ¼-gallon application of 90 to 95 asphaltic road oil and covered with 15 pounds of ⅜-inch to 10-mesh screenings per square yard and rolled.

New Denver Dealer Appointed by Lincoln Electric Co.

The Intermountain Belting & Packing Co., 1414 Wazee Street, Denver, Colo., has been appointed distributor for Shield Arc welders, electrodes and Linc-Weld motors by the Lincoln Electric Co., of Cleveland, Ohio., for the state of Colorado and part of Kansas, Nebraska and Wyoming. Various models of Shield Arc welders and Linc-Weld motors will be on display and a stock of Fleetweld and other electrodes will be maintained along with general welding accessories. Consultation service on any phase of welding is available without charge to welding users in the territory.

Light Plant $135

—for contractors' use. 1000-Watt, 32-Volt, self starting. For use with or without storage batteries. Heavy duty 140 Ampere Hour Battery, $70.00 extra.

Victor Manufacturing Co.
Box 76, Adrian, Michigan

PARSONS WHIRLWIND

Moves earth cheaper and quicker than any other machine of its size or for horsepower consumed. Suitable for terracing, ditch-cleaning, surface drains, and irrigation laterals, landscaping, golf course construction, etc. In fact a useful tool for grading or moving earth in shallow excavation anywhere.

Works behind any wheeled tractor preferably 15/30 H.P. with rear power take-off.

Already in use in nine states.

THE PARSONS COMPANY
NEWTON, IOWA

You Get Timken Bearings with the Two-Stage Air-Cooled Portable

. SIZES .
60A, 105, 160, 210 and 315
(Actual capacity at 100-lbs. pressure)
Gasoline, Oil Engine, or Electric-Driven.

(The fifth of a series of five advertisements).

1. Air-Cooled Compressors
2. Independent Cooling Systems
3. "Constant Level" Lubrication
4. Open Type Clutch
5. Timken Bearings

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Units Less Running Gear,
Steel Wheels, Solid Rubber Tires,
Pneumatic Tires, I-R Trailer,
Two-Wheel Trailer,
Motor Truck Mounted.

Over-size "Mirror Finish" adjustable Timken roller bearings are used for the main bearings of I-R Two-Stage, Air-Cooled Portable Compressors.

The use of roller bearings reduces the distance from the center of the main bearings to the center of crank pin bearings, permitting a short, rigid crankshaft.

Maximum bearing pressures are reduced, due to more even distribution of bearing loads resulting from the two-stage, multiple-cylinder construction.

Their tapered construction enables the bearings to carry radial loads, thrust loads, or both in combination.

The line contact of the tapered rollers and races assures maximum support and rigidity for the crankshaft under all operating conditions.

Timken positively aligned rollers assure accurate, frictionless bearing operating under all loads.

Write for catalog 3164 today.

Ingersoll-Rand
11 BROADWAY, NEW YORK CITY

285-2

Contractors Should Have Own Ins. Co.

(Continued from page 2)

ance increase, the amount of the bids must be increased correspondingly. This situation in itself is not so bad. In fact, if there were no other method of doing construction jobs, we might pay little attention to the problem. Every contractor would be subject to the heavy rates and the competition would be purely among them. However, this is not the case. If bids on projects become too high, the governmental agencies will begin to build their own projects on a force account basis. Perhaps you wonder how they can do this when governmental agencies must provide compensation to workmen in case of injury just as the contractors do. Here is the answer.

Govt. Agencies Get Better Rates

In the first place, there is apparently a definite limit to the amount that insurance companies will charge governmental agencies. This is due to the fact that governmental agencies will carry their own insurance if the rates demanded by the companies are too high. All state departments in Michigan, for example, contribute to an accident fund from which compensation claims arising from projects conducted by the state on a force account basis are paid. The question arises as to why the contractors can not do the same thing.

Most contractors are not in a position to take the risk that goes with carrying their own insurance. One serious accident might wipe them out entirely. Governmental units, on the other hand, can run the risk of carrying their own insurance because if a serious accident does occur, it is only necessary to pay the bill and then pass it along to the taxpayers. The individual office holder is not responsible and his own personal resources are not affected.

That the insurance companies realize this is evident upon making a comparison of the rates charged contractors in Michigan and those charged governmental units under the same conditions and for the same type of work. In many cases it was found that the contractors were paying from 50 to 75 per cent more for their insurance than were cities, counties and other agencies. It is plain that such a situation will eventually tend to eliminate the contract system.

Here is one example of this wide difference in insurance rates found in Michigan. The firm of Marsman and Tabor, highway contractor of Grand Rapids, has been paying a rate of $9.71 for construction, reconstruction, paving and repaving. At the same time and for the same type of work, the Kent County Road Commission has been paying a rate of only $3.56. For road construction the contractor's rate is $13.28 while the Road Commission has the same rate all the way through of $3.56. This is not an isolated case. Gould and Cross, also of Grand Rapids, who enjoy an even better rating than Marsman and Tabor, are paying $6.18 and $8.45 for the same work.

There are many more typical examples of the wide difference in insurance rates paid by individual contractors and those paid by governmental agencies. The fact that such are typical cases and not extremes makes the problem even more urgent.

Contractors' Rates Steadily Rising

The practice of raising rates from year to year is hard enough for the contractors but the insurance companies have complicated the situation even further by raising rates in the middle of a policy year. When bids on a project are submitted, an allowance for a certain amount to take care of compensation insurance is made. If, during the course of the project, the rate is raised, the contractor stands to lose a considerable amount of money. This has happened in Michigan already.

In such cases the contractor is helpless. Policies are subject to cancellation on thirty days notice. If the contractor refused to pay the increased rates, it would be a simple matter for the insurance company to give him notice and cancel his policy. Thus he merely jumps from the frying pan into the fire. It would be useless to make application to a new company since he would be subject to the new rating as set up by the Michigan Compensation Rating Bureau.

Status of Insurance Companies

Now that we have considered this problem from the standpoint of the contractors, let us inquire into the status of the insurance companies. As president

(Continued on page 26)

HERE'S A TRACTOR SHOVEL THAT CAN TAKE IT—whether digging, loading, subgrading, stripping, cleaning up, bulldozing, leveling, or excavating. Easily digs and loads up to 40 cubic yards per hour —WITH ONLY ONE MAN. 7-foot dumping clearance. Low operating cost and greater yardage bring bigger profits to every user. 3 heights, crawler or wheels, ½- or ¾-yard buckets, bulldozer attachment. Write for Catalog C-96 to Trackson Company, Milwaukee, Wisconsin.

TRACKSON HIGH SHOVEL

MULTIPLE - ROPE, POWER - ARM, POWER - WHEEL DRAGLINE BUCKETS

THE DIGGING DEMONS!

A comparison of output speaks loudly in favor of Williams Buckets. Write for Bulletins.

THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio

WILLIAMS BUCKETS

Make Use of the Industrial Experience of

INTERNATIONAL HARVESTER

When There's a Power Problem to Be Solved

Above: An International TracTracTor pulling a road grader on a country road project. International TracTracTors are available in three models: the compact T-20, the TA-40 (shown above), and the Diesel-powered TD-40.

The International Harvester line of industrial power includes wheel-type tractors, TracTracTors, stationary power units from 12 h. p. to more than 100 h. p. and 1½ to 5 h. p. engines for light-duty service.

Before long the *Millionth* Tractor of International Harvester manufacture will be coming off the assembly lines and going out to handle somebody's power job. That's by long odds the biggest tractor-production figure in the industry. It is also a measure of our thirty-year experience in this field —experience which will be of value to you when you have a power problem to handle and need efficieney and economy on the job.

If your work calls for powerful crawler or wheel tractors, small tractors for cramped areas, fixed power units, small engines or motor trucks — call on a branch or authorized industrial dealer in the International Harvester sales-service organization.

Vast numbers of successful installations of International Tractors, Power Units and Motor Trucks, all over the land, are your guarantee that this Company will give you the soundest, most profitable answer to your own power problem. Cash in on International *Experience.* Specific information will be sent by mail on request.

INTERNATIONAL HARVESTER COMPANY (INCORPORATED)
606 So. Michigan Ave. Chicago, Illinois

INTERNATIONAL HARVESTER

Construction of Santa Clara Dams

(Continued from page 2)

fill type and creates a reservoir with a capacity of 2,000 acre-feet. It has 2.5 to 1 upstream and downstream slopes with a crest width of 20 feet. The water side is protected by a 4-inch thickness of reinforced concrete on an 8-inch thickness of gravel. The face slab has contraction joints at 16 feet both ways with a weep hole in the center of each 16-foot square slab. The stripping for foundation was done mostly with a 1½-cubic yard Northwest shovel. The waste material was hauled by Autocar and White trucks to a dump upstream of the dam. The cut-off trench under the upstream impervious section of the dam was excavated in the stream bed by dragline, and on the sides of the canyon with a Northwest shovel.

The subcontractor on the stripping was Poulas & McEwen of Sacramento. John Collins had the subcontract for the embankment and used two 12-yard Le Tourneau Carryall scrapers, four 8-yard Carryall scrapers, two Le Tourneau bulldozers, one rooter for loosening material in the borrow pits, three Caterpillar diesel Seventy-fives and three Caterpillar diesel Fifties. On this dam about 75 per cent of the earth moving was done with the above equipment.

Floyd Bohnett, contractor with D. McDonald for the dam, used a 1½-ton Ford truck for delivery of dry concrete materials from the batching bunker to a 1-cubic yard paving mixer. The concrete for the 9-inch reinforced concrete jacket on the 36-inch welded steel outlet pipe, for collars on this pipe and for the outlet and inlet structures was deposited direct from the mixer. This was also the method used on the bulk of the 8-inch reinforced concrete lining of the spillway. The concrete for the face slab was hauled, after mixing, in a special cylinder holding 2 cubic yards, mounted on a Caterpillar diesel Thirty-five.

Calero Dams

Two dams were required to create the Calero Reservoir, second largest of the District's reservoirs, with 9,500 acre-feet of storage. These dams have the same general slopes and crest width, outlet through the main dam and 4-inch reinforced face slab as at Almaden. The cut-off trenches were excavated in the main with Le Tourneau Carryall scrapers. Some shovel and truck work was required on the cut-off trench of the main dam in the extreme bottom and on the cut-off trench near the top of the abutments. The stripping was mostly done with tractors and scrapers, as was also the entire embankment. This dirt-moving equipment included nine Caterpillar diesel Seventy-Fives, two Caterpillar diesel Fifties, seven Le Tourneau 12-yard Carryall scrapers, one 8-yard Carryall scraper, three Le Tourneau bulldozers, one Le Tourneau rooter and one 2-section Le Tourneau sheepsfoot roller with 8-roller units. Other equipment required for this work included the same equipment for concrete work as used at Almaden. The same general methods for concreting at Almaden were used at the Calero Dams and Spillway. Three 750-kw Kohler lighting plants, mounted on trucks supporting towers to support flood lights, illuminated the work in addition to lights on the Caterpillars. There was one 310-cubic foot Ingersoll-Rand air compressor used on this work. Several Ingersoll-Rand air pumps were used to unwater the foundation.

Almaden-Calero Conduit

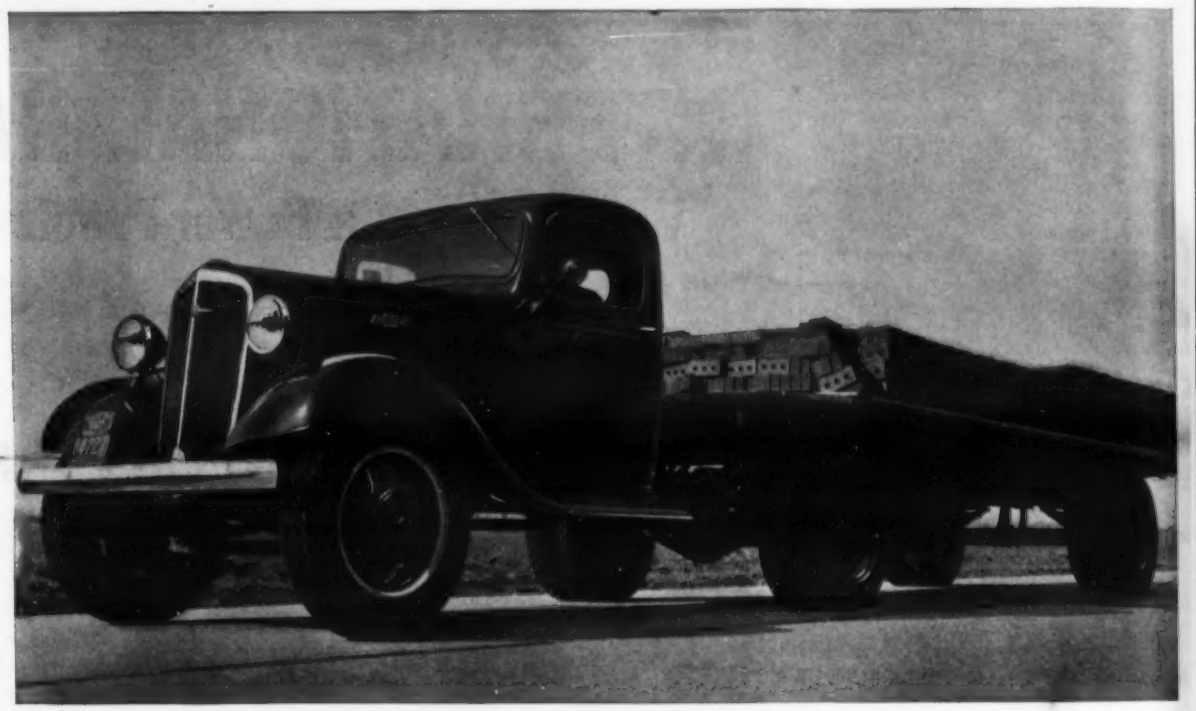
Included in McDonald & Bohnett's contract with the Almaden-Calero unit was a 4.5-mile 100-second-foot canal from Almaden Reservoir to Calero Reservoir. The canal has a 6-foot bottom width and 4.5-foot depth, and was excavated mainly in the side hill by first excavating a bench with a 1½-cubic yard Northwest shovel and later excavating the canal prism with a trench hoe attachment. Poulas & McEwen of Sacramento was the subcontractor on the excavation. Poulas & McEwen also used two 310.

(Continued on page 32)

DATA ON SANTA CLARA VALLEY WATER CONSERVATION DISTRICT RESERVOIRS

	ALMADEN-CALERO UNIT ALMADEN (One Contract)	ALMADEN-CALERO UNIT CALERO (One Contract)	COYOTE	GUADALUPE	STEVENS CREEK	VASONA
Type of Dam	Rolled Earth Fill	Rolled Earth Fill	Rolled Earth & Rock Fill	Rolled Earth Fill	Rolled Earth Fill	Rolled Earth Fill
Dam Crest, Length—Feet	460	840	990	650	1,000	1,000
Height of Crest above Streambed—Feet	105	90	120	129	120	30
Max. Height above Foundation—Feet		124				
Dam Crest, Width—Feet	20	20	100—160	20	20	20
Dam Base, Width—Feet	545	495	945	650	620	153
Foundation	Impervious	Impervious	Impervious	Impervious	Impervious	Impervious
Type of Spillway	Side Channel	Saddle Type	Concrete Overflow	Side Channel	Side Channel	Buttress Dam
Capacity of Spillway—Cu. Ft. per Sec.	7,000	5,000	33,000	6,000	10,000	12,600
Outlet Pipe, Diameter—Inches	36	36	50	36	30	42
Outlet Pipe, Length—Feet	690	450	900	690	680	20
Capacity of Reservoir—Acre Feet	2,000	9,500	30,000	3,500	4,000	750
Area of Reservoir (Max.)—Acres	62	329	688	75	95	79
Length of Reservoir (Max.)—Miles	1.1	2.2	5.8	1.1	1.1	0.8
Cubic Yards of Earth and Rock	422,000	722,000	1,200,000	612,000	567,000	62,000
Cubic Yards of Concrete	3,400	4,000	4,000	5,800	5,700	2,300
Tons of Steel	140	166	125	146	200	170
Contractor	McDonald & Bohnett	McDonald & Bohnett	Macco Construction Co.	A. Teichert & Son	McDonald & Bohnett Crow Bros.	Carl N. Swenson Co.
Subcontractor on Fill	John Collins					
Contract Awarded	December 31, 1934	December 31, 1934	April 17, 1935	March 13, 1935	December 31, 1934	October 31, 1934
Final Cost	$235,881.69	$233,404.65	†$674,958.19	$237,173.10	$223,117.53	$115,356.33
Contract Accepted	March 10, 1936		††	December 3, 1935	December 8, 1935	August 6, 1935
Resident Engineer	J. Winter Smith	R. P. Bryan	G. W. Hunt	T. D. Sawyer	Frank W. Moore	J. Winter Smith
Sluice and Butterfly Valves (Hydraulic)	Joshua Hendy Iron Works, Sunnyvale, California					
Contractor's Superintendent	Chas. Potter	Chas. Potter	Ben Wells	Ed. Hullin	Chas. Potter	Chas. Bundy
Supervising Field Engineer			Harold I. Wood			

††Completion date set ahead to allow use of stored water.
† Estimated.

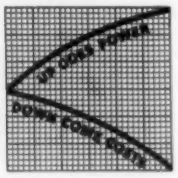


Low-Priced . . . High-Powered

CHEVROLET TRUCKS

The Most Economical Trucks for Construction Haulage

NEW PERFECTED HYDRAULIC BRAKES
always equalized for quick, unswerving, "straight line" stops



Contractors and building supply companies everywhere are purchasing low-priced, high-powered Chevrolet trucks as the equipment best suited for their haulage needs. Here are four good reasons why:

FIRST: New Chevrolet trucks have the greatest *pulling power* of any trucks in the low-price range . . . plenty of power for the heavier loads.

SECOND: Chevrolet's High-Compression Valve-in-Head Engine is not only very powerful but more economical . . . it uses less gas and less oil.

THIRD: Features like Chevrolet's New Perfected Hydraulic Brakes, massive Full-Floating Rear Axle and rugged 4-Speed Transmission assure owners of long-lived, dependable service with lowest maintenance expense.

FOURTH: The first cost is notably low—and that means less depreciation and a better investment.

Convince yourself of the great power and economy of Chevrolet trucks with a demonstration on your own haulage jobs. Your Chevrolet dealer will gladly arrange such a test.

NEW HIGH-COMPRESSION VALVE-IN-HEAD ENGINE
with increased horsepower, increased torque, greater economy in gas and oil

NEW FULL-TRIMMED DE LUXE CAB

with clear-vision instrument panel for safe control

FULL-FLOATING REAR AXLE
with barrel type wheel bearings on 1½-ton models

CHEVROLET MOTOR COMPANY, DETROIT, MICHIGAN

FOR ECONOMICAL CHEVROLET TRANSPORTATION

GENERAL MOTORS INSTALLMENT PLAN—MONTHLY PAYMENTS TO SUIT YOUR PURSE

GALION GRADERS Go Where Needed . . . Serve Well

In Canada . . West Indies . . Central America and Mexico . . South America . . Oceana . . Asia and Far East . . Europe . . Africa . . all over the United States . . wherever you go . . . you will find Galion Road Machinery Units on their assigned job.

Illustration above shows two Galion Leaning Wheel Graders at work in one of our National Parks in the Western United States. We like this picture and we envy these Galion Units their close approach to such natural beauty.

A Galion will complete any picture where road building and maintenance is of first importance. Galion can provide just the right Unit . . each with a record of success behind it . . to do any job you may have.

Galion Motor Graders . . Pull Type Graders . . Road Rollers . . Drags . . Spreaders . . Planers . . Rooters . . like the Marines . . go where needed . . and serve well. You can depend upon them.

Let our Galion Engineers . . they know Road Machinery from A to Z . . show you how to do it efficiently and economically.

Galion Road Machinery:
Motor Patrol Graders (Manual or Hydraulic Control)
Leaning Wheel Graders (Manual or Hydraulic Control)
Straight Wheel Graders
Road Rollers (with Roll-A-Plane Attachment)
Tandem Rollers
Portable Rollers
Road Planers
Spreaders
Drags
Scrapers
Rooters

Distributors Everywhere

The Galion Iron Works & Mfg. Co.

Galion Ohio

Damage By Frost Heaves and Boils

Causes and Methods of Preventing Spring Damage to Highways During Thaws

IN Ohio and Minnesota, to name but two of the many states which suffered severe damage to roads from frost last winter, there were hundreds of miles of highway rendered useless to heavy vehicles during the thaws of late March and early April. On the other hand, Rhode Island and Massachusetts claim there was no damage to state roads from frost heaves and boils. What is the reason and how can this gigantic force of nature be checked? There is no better time than this month to get down to business because it is too late when the winter comes to do anything to stop the damage.

It is well known that freezing of water in the subgrade can cause dangerous heaving, cracking and premature failure of road surfaces and pavements. If the heaving and later settlement were uniform there would perhaps not be much trouble, but it is the differential heaving, which Henry Aaron of the U. S. Bureau of Public Roads ascribes to variations in soil profile, that causes the damage.

A description of the annual plague of frost heaving was given by G. C. Dillman in the 1928 Proceedings of the Seventh Annual Meeting of the Highway Research Board:

"In the first place, there seems to be no common understanding as to just what is meant by the term 'frost boils.' Two different phenomena are generally included under this term. First: A more or less oval hump which may be only a few feet across, or may extend for 30 or 40 feet over as large a diameter, with a rise of as much as a foot above the normal profile of the surface. Second: A general heaving in the center of the road surface, which may extend for hundreds of feet along the surface of the road; but, in general, the difference in elevation is not so marked as in the case first mentioned, and usually the increase in the elevation of the surface, due to this class of heave, is at a maximum on the center line. These two manifestations of frost action are due to the same cause, but are influenced by somewhat different factors. They both may properly be termed frost boils.

"In many cases the term is more loosely applied to a comparatively thin surface of road metal, which has been broken through to a semi-liquid soil, just underneath the top crust, which is held in place and from which the drainage is prevented by a frozen layer of soil directly beneath and about this liquid mass. This condition may or may not have been preceded by the heaving so characteristic of a genuine frost boil . . ."

Another description of these trouble makers was given by W. C. Buetow at the Eighth Annual Asphalt Paving Conference: "Frost boils, from their name, start forming with the first good freezing weather . . . Usually the snow has almost all disappeared before the usual signs show on the surface of the semi-rigid type of pavement. With the concrete surface the usual symptoms cannot be detected as readily except when water oozes through the joints or cracks and leaves a finely divided sediment on the surface of the pavement. In the unsurfaced and semi-rigid types of road the entire surface quakes as the concentrated load is applied. Before the frost has gone out enough to start the boils to act, the frost has gone out of the upper 6 inches to a foot of the surface. This much of the surface dries out readily and becomes a hard crust on an unsurfaced or gravel road. A thickness of 6 inches will sustain quite a load. The surface from all outward appearances seems in good condition. As the frost goes out below there are changing conditions underneath which soon show on the surface. There are times during the breakup when a person is able to cause quite an area to quake by the shifting of his weight. If travel were kept off the highway during this time, the surface would remain intact. The passage of vehicles over this spot causes a puddling action and stirs up the mass underneath the crust. When the subsoil is worked into a semi-fluid state, the surface becomes warped and cracked in places. As soon as this happens, an eruption starts with ejection of the mud by boiling action. Travel continuing over these areas breaks through and becomes mired."

Clay Containing Ice Layers From Under a Badly Heaved Concrete Street in St. Peter, Minn.

Theory of Frost Heaving

Prof. F. H. Eno has described the theory of frost heaving in a concise statement which we quote: "In freezing weather, with some fine silty-clay soils, where the rate of freezing and the movement of water in the capillaries appear to correlate, freezing seems to withdraw the water from the larger capillaries and to freeze it into lenticular masses of free ice, which continue to grow as more water is attracted until the excess supply of water through the capillaries has been exhausted, or until the rate of freezing increases beyond the rate at which the water is supplied. Then the water and soil are frozen as they stand until the correlation is again established and ice layers formed.

"It is quite evident, therefore, that when this situation arises, the pavement

(Continued on page 31)

Control MAKES THE DIFFERENCE
SPONTANEOUS COMBUSTION
VS.
CONTROLLED IGNITION
A pile of greasy wipe rags in the corner. Heat generates . . . and sooner or later . . . pfoof! . . . building and equipment go up in flames. Spontaneous combustion is uncontrolled . . . and is the direct opposite of Controlled Ignition.
CONTROL means ECONOMY

Controlled Ignition MEANS LOWER FIRST COST .. LESS DEAD WEIGHT ... LOWER OPERATING COSTS

A WASHINGTON owner found that an Allis-Chalmers Model "L-O" Oil Tractor saved 77% on fuel costs . . . compared to a 60 H. P. gasoline tractor . . . and did far more work. ● It is only logical that the A-C Controlled Ignition principle should assure maximum economy. Diesel fuel oil is ignited with a spark at a point which is *controlled* for greatest efficiency. Dead weight is reduced . . . through elimination of special, heavy construction. No extra weight and upkeep of an auxiliary starting motor. No need to waste fuel keeping the engine running while tractor is idle—because Controlled Ignition tractors start *instantly*. Be a step ahead! Investigate before you buy! Ask an A-C dealer for the facts!

FEWE GALLO Plu LESS C PER GA Equa THIS SAVING YOUR F DOLL

New 1½-Yard Shovel

Second in the new 700 series of diesel-powered excavators announced this year by Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis., is the Model 705, a full-revolving machine with 1½-yard capacity.

Completely redesigned to take advantage of the newest developments in high tensile alloy steels and the use of arc welding, considerable emphasis has been laid upon weight reduction to obtain a higher ratio of horsepower per pound of weight.

The standard power unit on this new 1½-yard machine is a 6-cylinder Caterpillar diesel engine rated at 130 hp at 900 rpm, although gasoline power is also available. Model 705 is fully convertible for service as a shovel, dragline, crane, trench hoe, skimmer or pile driver.

A New Measuring Tape

Wyteface, a new steel measuring tape recently announced by Keuffel & Esser Co., Hoboken, N. J., has black on white graduations, making for legibility even in poor light. The surface of this tape is claimed to stay white, and will not crack or chip. It not only protects the tape from rust but also adds to the spring of the steel, making it bend in wider arcs and decreasing its tendency to curl or kink.

Otherwise Wyteface is a standard steel tape, accurate and subject to the same correction factors. The case is of black leather and all exposed metal parts are either of stainless steel or chromium plated to hold their finish indefinitely.

These steel tapes come in three lengths, 25, 50 and 100 feet, marked in 10ths or 12ths of feet.

A New Steel Tape for Contractors and Engineers

CONTROLLED *Instant* STARTING
Easy starting, regardless of weather. Crank or self-starter. No auxiliary starting motor.

CONTROLLED INJECTION OF FUEL
Diesel fuel oil is sprayed (not squirted) into the combustion chamber at 60° before top dead center. Fuel pump of A-C design . . . measures charge of fuel accurately, regardless of load or throttle setting. Simplest, easiest to service fuel pump built. Controlled pressure in fuel lines — no hammer-like blows from sudden pressure changes.

CONTROLLED AIR-FUEL RATIO
Specially designed injection system maintains proper ratio for efficient combustion at ALL engine speeds. No excess of air at idle speeds to lower exhaust temperatures at the expense of power.

CONTROLLED IGNITION . . .
Controlled spark ignition at exactly the proper point for complete efficient combustion. No chance of power-wasting pre-ignition. High compression pressures with the resulting destructive forces are eliminated. No need of special rings, special high-pressure bearings, special lubricating oil or heat reservoirs in the combustion chamber.

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ALLIS-CHALMERS TRACTOR DIVISION—MILWAUKEE, U. S. A.
Controlled Ignition OIL TRACTORS

Baked Clay Roads In Australia

Traveling Furnace Which Bakes Clay on Road Produces Stable Foundation

By ALLEN P. CHILD

(Photo on page 44)

IN Queensland, Australia, the heat treatment of soils for making a base for road construction by means of a traveling furnace has been found to destroy the parts of the soil which are responsible for plasticity or the instability that so many soils possess in wet weather. The process and the furnace used in this treatment were developed by an Australian engineer, I. R. H. Irvine, and are being used by the Main Roads Commissions of Queensland and New South Wales in the preparation of road foundations.

The Baking Process

The soil is first loosened by scarifying to a depth of about 16 inches. When the soil has been thoroughly worked over and broken into clods, the hot gas developed in the furnace penetrates into the mass effectively, destroying the plastic constituents of the soil, as the heat changes both its chemical nature and its physical form.

After the heating furnace has passed over the material, clay or other binder is added, the altered particles being bound with material unaffected by the heat into uniformly distributed lumps of tough stable aggregate. The surface is then rolled.

The Furnace

The machine used for heating the soil consists of an outer chassis about 24 feet in length by 8 feet in width, supported in the front and rear by axles and wheels. The chassis carries the furnace on a three point suspension and the furnace may be lowered or raised in its relation to the road surface.

At the rear of the furnace is a vertical fire box for firing the wood which is used as fuel. This fire box is provided with a tightly fitted door and by means of a forced draft on the top of the fire, the hot gases are taken down through vertical vents in fire brick to a combustion chamber, 12 feet long by 6 feet wide and lined on the sides and roof with fire brick. The road surface forms the bottom of the combustion chamber of this portable unit.

A forced draft fan at the rear of the furnace supplies air for increasing the longitudinal flow of heat from the rear to the front as well as to supply additional air for complete combustion. A small gasoline engine at the front of the machine operates the three draft fans and the two additional cooling fans when the furnace is in operation. The slow forward motion of the furnace along the road is provided by this engine as well, accomplished through a system of gear reductions to a winding drum on the front of the machine. From this drum the hauling cable is attached to a stake driven some distance ahead of the machine.

The forward motion of the machine can be adjusted to any speed up to 30 feet an hour but the average burning speed is less.

Results

Experiments have shown that an improved foundation material is produced by this means which is unaffected by moisture and varies in quality from a soft clinker to partially burned brick, with quantities of finer material whose clay properties have been destroyed by the heat.

WPA Photo

Washington's Largest Culvert Under Construction

Large Concrete Culvert Completed in Wash.

By TED INGELS,
Spokane County Engineer

The largest culvert in the state of Washington has recently been completed as part of the Mead cut-off project, near Spokane. The problem involved conveying the waters of Deadman Creek, which rises on the slopes of Mount Spokane, under the 90,000-yard Mead cut-off fill and presented several angles. During the summer, the creek is just a small stream but in the spring when the snows on the timber-clad slopes of Mount Spokane are melting, the stream turns into a raging torrent, requiring a culvert of large cross section.

The WPA engineers decided to construct a concrete culvert which would serve two purposes. When the water is high, it protects the surrounding land by carrying off the water and when the water is low, the culvert is used by nearby ranchers as a cattle pass.

The Mead culvert is 8 feet square and 180 feet long, requiring 337 cubic yards of concrete and 48,000 pounds of steel. A total of 1,097 bags of cement was used on the job.

The culvert is built on a graduated plan, with the top and bottom sections at the portals 10 inches thick. Each section is gradually strengthened until the center section, which lies directly under the heaviest part of the fill, is 24 inches thick. The Mead fill will ultimately reach a height of 57 feet and will exert a 350-ton pressure at the center of the culvert.

Another and unusual use of concrete occurred on this job. Construction of new highway approaches to the fill, which replaces a dangerous steel bridge, resulted in tearing out two long sections of old concrete highway. The pieces were blasted out and transported to the upstream portal of the culvert where they were used as revetments to prevent washing of the stream banks and to protect the loose sand fill on each side of the portal.

Air-Driven Vibrators for Placing Concrete

The merit of the vibration of concrete is an established fact, as evidenced by the numerous Federal, state and private agencies now requiring the vibration of concrete in all important work. Vibration tends to eliminate honey combing, air bubbles and scaly surfaces, increases the bond between the old and new concrete and between the concrete reinforcements, and permits the placing of low slump concrete which could not be handled manually.

The Type E-1 air-driven concrete vibrator, made by Munsell Concrete Vibrators, 997 West Side Ave., Jersey City, N. J., is designed for use in the corners of the forms, and the hard-to-get-at places, or directed under cross members of the structure. It is a streamlined model, with no expensive flexible shaft or motor. It is equipped with a ¾-inch cross handle controlled by a valve and connected to the inlet of the vibrator inside a 2½-inch hose exhaust.

Type E-2 is equipped with a ¾-inch air line, controlled from the compressor, connected to the inlet of the vibrator inside the 2½-inch hose exhaust. This model is recommended for work such as bridge decks, floors, columns or abutments. Additional air line can be added as needed.

Both of these models are 5 inches in diameter at the largest circumference and are 6 feet in total overall length.

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Pickwick Dam

(Continued from page 11)

The storage area is an oval made up of two semi-circles having radii of 250 feet and connected by tangents 75 feet long. Around the storage area is a wide-gage track on which a movable tower operates. In the center of the area there is located a fixed tower with a turnhead through which material may be delivered to any one of six chutes to put it into one of the six divisions of the storage area. Between the movable tower and the fixed tower there is a dragline scraper which moves the aggregates away from the center for storage, and moves it back to the center for delivery to the belts running to the mixing plant. Under the storage area, located in a tunnel, is the first belt which is loaded through gates in the bottom of the central tower. This equipment and method of storage is known as the Kern System.

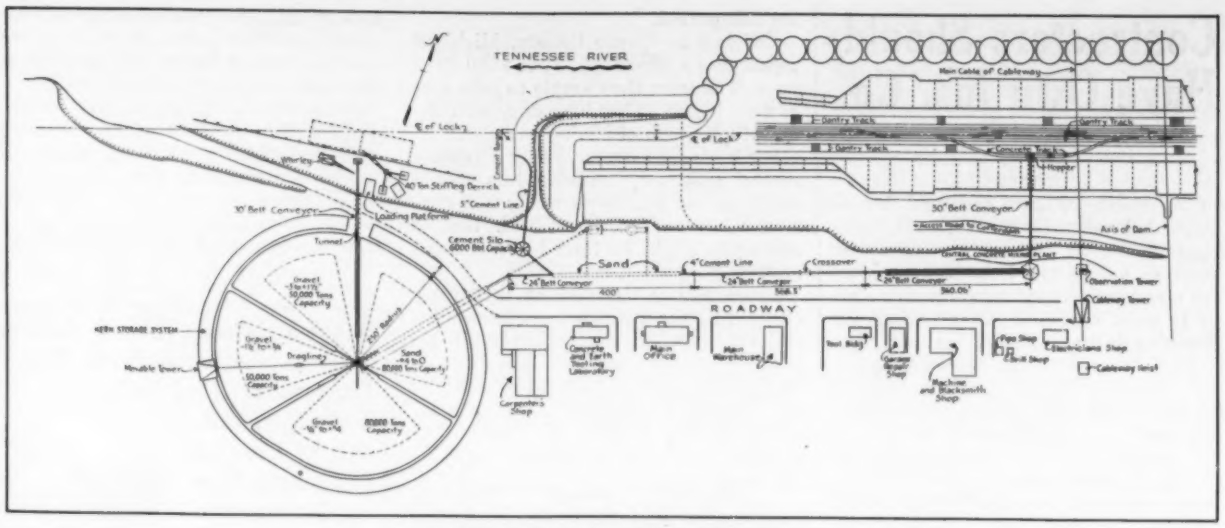
The aggregates are received at the unloading dock on barges, unloaded by derricks and clamshells to a hopper, from which they are carried on a belt conveyor to the top of the central tower and placed in the proper stockpile through the turnhead and chutes. The cement is received on barges and transferred through a pipe by a Fuller-Kenyon pump to the silo.

The aggregates are moved from stockpiles to bins in the top of the mixing plant by Barber-Greene belt conveyors with Goodrich belts and the cement is moved from the silo to the mixing plant through a 4-inch pipe by a Robinson pneumatic conveyor.

Central Mixing Plant

The central mixing plant is a steel structure 110 feet high, and in the top are located the cement and aggregate bins. On the third floor are located the batchers and the plant inspector's room. The batchers are all Johnson weighing batchers with Johnson scales, except the cement scale which is a Toledo with an automatic recording device which records the weight of every load of cement passed through it. The bin gates are all manually operated except the cement gate and water valve which close automatically. The batcher unloading gates are all operated by air from one operating stand.

On the second floor is an automatic power turnhead that delivers the batch of aggregates through the proper chute to any one of three mixers. On the first floor are located three 2-yard mixers, two Davis tilting units and one Ransome non-tilting machine, driven by electric motors and operated by one man from a central operating stand. The mixers are located on a circle and all discharge into one hopper. The controls are all pneumatic or electrical, and the sequence of operations of the batchers, turnhead, and mixers is so regulated by a system of interlocks that the operators cannot make mistakes. The timing of mixing is controlled by General Electric timing clocks located in the inspector's room; also in this room are located four electric counters, one connected to each machine and one on the cement batcher to serve as a totaling counter. One set of batchers serves the three mixers, the mixing time is one and three-quarter minutes, and under normal conditions the plant produces 3,000 cubic yards of concrete in 24 hours. The operating crew in the plant is seven men, one on the bins, two on the batcher floor, one mixing operator, two laborers, and a foreman.



Layout of Plant at Pickwick Dam

Concrete Placing

The concrete is handled from the mix-

(Continued on page 34)

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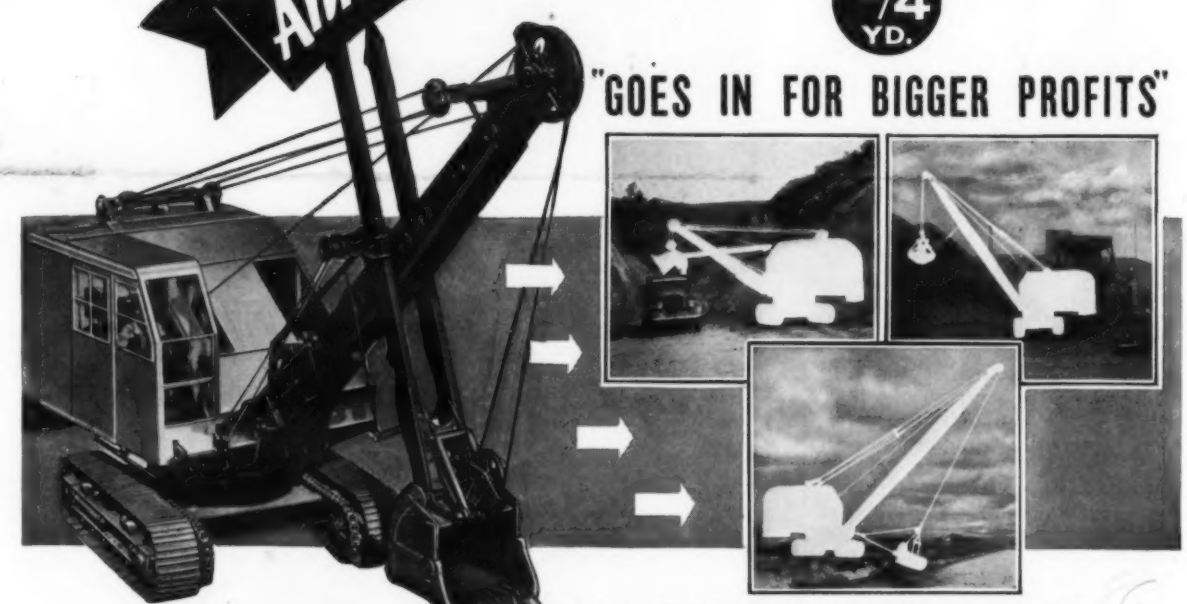

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P&H PACEMAKERS—FASTER ON THE JOB

Contractors Should Have Own Ins. Co.

(Continued from page 19)

of the Michigan Road Builders' Association, I appointed a committee to investigate the advisability of forming a company to handle the insurance problem for construction contractors in this state or to work out some other method for lowering insurance rates.

Their report reveals that during the lean years of 1931-33 compensation insurance companies operating in Michigan suffered due to lack of activity in the construction field. Things began to change in 1934, however. In that year, these companies collected a total of $2,858,000 in premiums and paid out $2,641,000 for claims. This left them with gross earnings of $217,000. From January 1, 1935, to October 1, 1935, they received premiums totaling $5,046,000 while they paid out in claims during the same period, $3,189,000. This gave them gross earnings of $1,857,000 for the first three quarters of 1935.

It should be noted that although the amount of premiums nearly doubled, the amount of claims paid was increased only 20 per cent. This would seem to indicate that a reduction in rates was in order. But just the opposite resulted. Rates are now higher than ever.

The committee's report reveals further that the operating companies are evidently trying to make up for the losses they sustained in 1931-33 by raising rates to the highest possible point. We might be able to sympathize with this point of view if the contractors had been responsible for the losses incurred in those years. However, the operating companies themselves must admit that the industry as a whole is not responsible.

It might be well to emphasize to the insurance groups that it was lack of activity on the part of contractors which placed their companies in difficulty. If, in their efforts to recover their lost funds, they again drive contractors into inactivity, they will find themselves in a similar position as in 1931-33.

It is not difficult to find evidence that present rates are unnecessarily high. The J. A. Mercier Co., Detroit road contractor, has carried its own insurance for the past 20 years. This company reports a cost of $4.00 per $100.00 of payroll and it has had the misfortune to suffer several large losses during the past few years. This is the highest rate set up by any contractor carrying his own insurance in Michigan.

At the other end of the scale is the Ray D. Baker Contracting & Engineering Co., of Detroit. This firm has carried its own insurance for a period of more than 20 years. Its work consists largely of water mains, open cut sewers, and tunnel sewers which is considered a hazardous type of work. The actual cost for workmen's compensation has been only $0.60 per $100.00 of payroll during this period.

Officials in Wayne County, Michigan report that a rate of $2.50 per $100.00 of payroll is more than ample to take care of their losses. They have done millions of dollars worth of paving on a force account basis. Of course, being a governmental unit, any unusual loss would revert to the taxpayers whereas a contractor, as an individual with limited resources, might be forced out of business.

From this it is obvious that rates charged by the insurance companies are seriously out of line. Surely, if an individual contractor can take care of his losses at rates of from $0.60 to $4.00 per $100.00 of payroll, insurance companies making it their sole business to provide such insurance can do it at similar rates.

Contractors Should Form Company

In the face of this, it seems to me that the logical course for road builders to follow is in the direction of a company of their own. Reports from other states indicate that the problem is widespread and I urge that action be taken by the road builders of the country to form an insurance company of their own.

Editor's Note: At the January meeting of the A.R.B.A., Mr. Hudson proposed, at the end of his paper from which this article is abstracted, that a committee be appointed to investigate ways and means of organizing such a company. This committee, of which Mr. Hudson is Chairman, reported at the annual meeting of the Association in April and it was then decided that the Committee should make a complete survey of the situation, add to the Committee if necessary, and study various plans for the formation of a contractors' insurance company for workmen's compensation insurance, to be owned and operated by contractors and to insure contractors only.

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And so eye-arresting is the advanced streamlined styling of this big, rugged GMC that owners can place a real dollars-and-cents value on such fine appearance. All in all, this modern GMC in the 3-ton range as well as every other type in the medium and heavier-duty ranges is truly an exceptional value—one that is a challenge to the field, especially when price is considered.

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General Motors Trucks and Trailers

GENERAL MOTORS TRUCK COMPANY, PONTIAC, MICHIGAN

Penna. County Road Dept. Well-Organized

(Continued from page 10)

ment work. In the winter, they erect snow fence, assist in the snow removal work and take care of the ashing or cindering of all the roads in their respective districts.

To do this work they are furnished with a long-wheel-base, low-bodied 1½-ton dump truck, one cold-patch mixer and the usual hand tools. Each district truck, mixer and tools are stored in a rented garage in their respective districts, the garages being centrally located in each district.

Two floating road crews work out of the central warehouse, located at the county seat. One crew, which erects guard rail and warning signs, repairs head walls, renews cross drains and does similar work, is furnished with a 1½-ton dump truck of the same type as used by the district maintenance forces.

The other floating road gang working out of the central warehouse does most of the hauling work. They haul crushed stone, drums of cold patch, cement, cinders and, by means of a trailer, haul road rollers and tractors from one point to another in the county.

Two bridge repair crews work out of the central warehouse. One crew takes care of all stone and concrete repairs while the other takes care of all wood and steel work. The concrete gang is provided with a 1½-ton dump truck, concrete mixer, centrifugal pump and other miscellaneous equipment, while the wood and steel gang uses a 2½-ton canopy-top truck equipped with a special body to haul bridge plank and the tools, blocks and tackle.

Care of Equipment

The central warehouse services and repairs all trucks, rollers, tractors, mixers, graders and automobiles. They take care of three 10-ton rollers, one 5-ton tandem roller, two 3½-ton dump trucks, seven 1½-ton dump trucks, two 1½-ton and one 2½-ton canopy-top trucks, six passenger cars, one rotary snow plow, two V-type tractor plows, four tractors and twenty blade-type plows, together with road graders and other miscellaneous equipment. The warehouse organization consists of a foreman, two mechanics, a blacksmith, two mechanics' helpers, a stock room clerk and a night watchman.

Snow Removal

The snow removal organization consists of six blade plows for 1½-ton trucks, fourteen blade plows for 3½ to 5-ton trucks, two tractor-operated V-type plows with wings and one tractor-operated rotary plow.

The six 1½-ton trucks, which are county owned, start plowing as soon as the snow reaches an inch in depth. If the snowing continues at such a rate that the district plows cannot cope with it, the 5-ton trucks, which are rented by the hour, are called into action. These trucks, each of which is assigned to a certain section of road, are directed in their work by a road caretaker, who accompanies the truck for the duration of the work. Later the tractor-operated plows, which are county owned, are called upon to widen and push back the snow and clear all drifted sections on the roads.

Engineering Department Personnel

The Engineering Department is composed of a chief engineer, road designer, draftsman and a road inspector, one bridge designer and a bridge inspector, one surveying corps, a cost accountant and stenographer and claim agent or right-of-way man.

Arizona's Road Progress

The oiling of the state highway system of Arizona was started in 1929 as a means of laying the dust and making it possible for traffic to see ahead and proceed with safety. Even four years ago it was impossible to take a 100-mile drive over state highways and be sure that one could return the same day.

Today the picture is very different. Oiled roads, road-mix or plant-mix types, or concrete pavements cover 95 per cent of the east and west primary roads and the essential north and south roads, according to reports from the Arizona State Highway Department. There is a section of U. S. 60 in the eastern part of the state from Globe east that is yet to be paved. This section is in two Indian reservations which, because it is Indian land, will be financed 100 per cent by Federal Aid.

The old story of the terrible roads in the desert is no longer true. With interesting cactus growths on either side the traveler in Arizona today traverses good roads on all the main highways. The present program includes considerable straightening of highways to present to the traveler a maximum of comfort and a minimum of danger.

There are 3,500 miles of highway in the Arizona state highway system, of which 575 miles are in the various Indian reservations.

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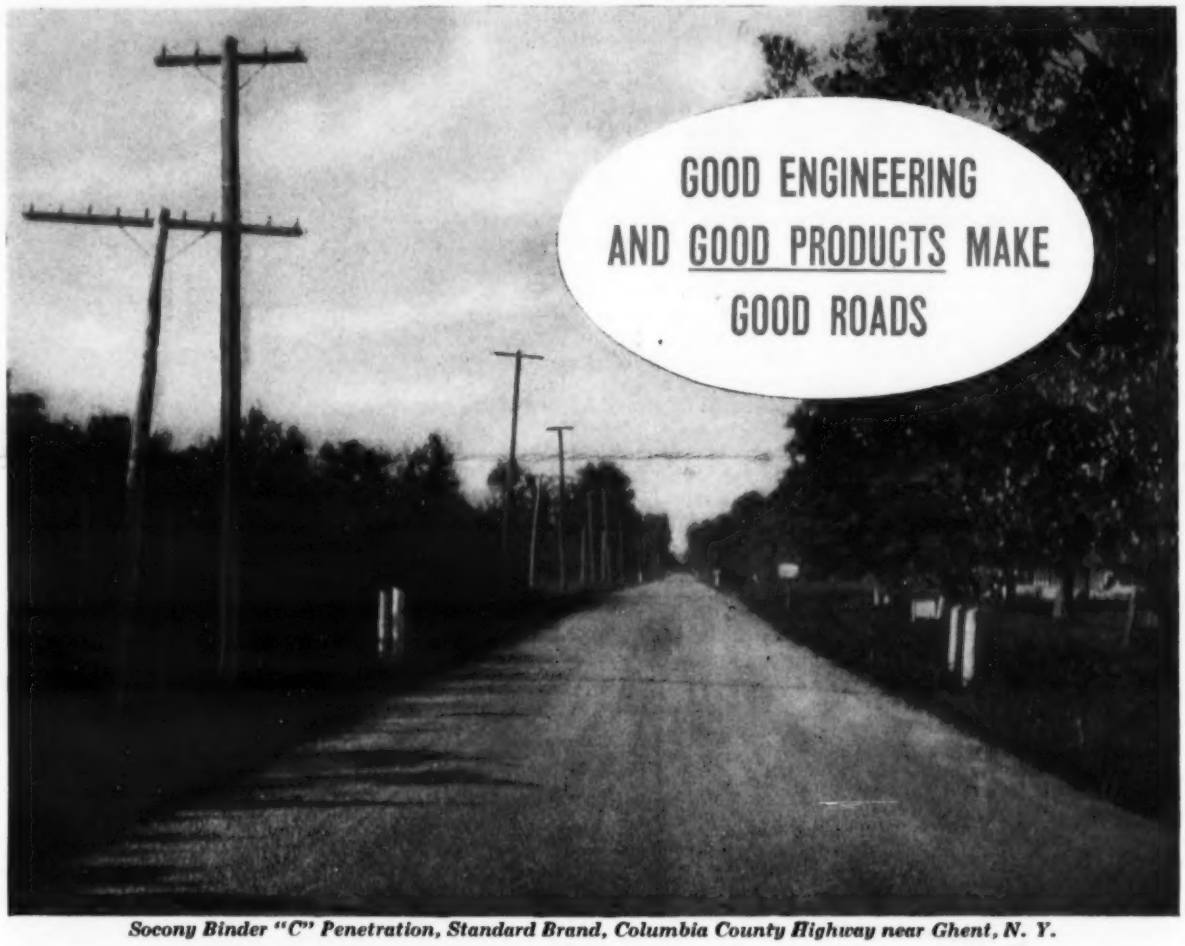

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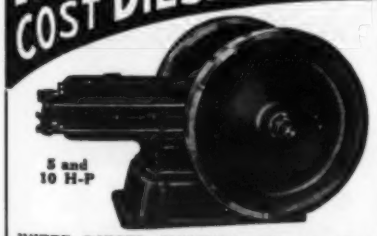

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High Water At Bonneville Presents Another Problem for the Contractor

Picks and Shovels

(Continued from page 1)

Opportunity knocks but once, they say, and seldom is there a chance to earn so much for so little labor.

The speaker emerged from the car and the amazed and delighted eyes of the crew beheld his head swathed in a bath towel which held an ice bag firmly against his crown. As the men approached the car, they saw that the other occupants were similarly turbaned. Even the dog which was led to water during the process of tire changing had his head swathed and iced.

The change took a matter of five minutes and the ten dollars was passed over, and gleefully divided among the men who found great amusement in the preparations of these frightened easterners for the ordeal of crossing the desert.

It's a long cry from the days when a serious experiment of a camel caravan was carried out, in the hope that this importation from the Sahara would make it possible to conquer the desert of our own West. The privations of the early pioneer have gone with the days of the buffalo, whooping Indians and covered wagons and today the Arizona desert is crossed on a well-maintained highway in much the same comfort and safety with which one travels elsewhere.

It's hot, yes—but probably less difficult to bear than the sweltering humidity to which those easterners should be quite accustomed. Perhaps after all, heat, like sea-sickness, is a state of mind.

New Koehring Distributors

Koehring Co., Milwaukee, Wis., has recently announced the appointment of three new distributors for its equipment. The Arizona Lumber Co., 9th and Jefferson Sts., Phoenix, Ariz., will handle the Koehring line of shovels, cranes, draglines, pavers, mixers, Trail-Dumps, Mud-Jacks and Dumptors, in the state of Arizona.

The Dallas territory is now being handled by the Leland Equipment Co. of Texas, 3915 Main St., Dallas, Texas. Mr. Burrows, formerly of Clark & Burrows, will continue his association with Koehring. The Roanoke Tractor & Equipment Co., 405 Center Ave., N. W., Roanoke, Va., is now serving the Virginia territory. W. H. McIlhany will be manager in charge of sales.

Gasoline consumption by motor vehicles in 1935 increased 6.4 per cent over the preceding year and state taxes yielded a revenue of $619,000,000, according to statistics collected by the U. S. Bureau of Public Roads. Every state reported increased consumption, the largest increase being 13.4 per cent in New Mexico.

"In Spite o' Hell Or High Water"

By HENRY W. YOUNG

HIGH water in June presented the Columbia Construction Co. with a number of hurry-up jobs at Bonneville to save parts of the construction, one of which is shown in the illustration.

A section of 70-foot interlocking steel piling, comprising approximately 100 piles, broke away from its bolted fastenings to crib No. 7 of the original south cofferdam, and tipped outward from the crib at the top, as shown. Soundings showed that sand had been washed into the space between the crib and the tipped piling to a depth of at least 15 feet. This was so closely packed as to prevent the piles from being pulled back into place against the crib.

The first thing to do was to remove the sand. At the time the photograph was taken, July 7, they were about to attempt this by pulling three piles at the downstream end of the tipped section, namely, piles 57, 58 and 60, leaving pile 59 standing.

It was expected that when this was done, and an outlet provided on the downstream end, the current would then scour the sand out at the bottom, through the opening provided by the pulling of the piles, and that the whole section could then be pulled back into place and fastened to the crib and new piles driven to replace those pulled.

The equipment used was a Vulcan pile puller with a capacity of 250 tons. The derrick rig consisted of a ⅞-inch steel 16-part line to a three-drum Clyde hoist driven by a steam donkey. The work was at a point about 100 feet upstream from the outermost pier of the spillway, through which water was being diverted. The current is exceedingly swift and the water from 50 to 60 feet deep.

The best laid plans sometimes go wrong and after the piles were pulled, it was found that the scouring action was not sufficient to enable the piles to be pulled all the way back into place, though they were moved part way.

This is typical of the continual emergencies which arise on a construction job, particularly one of such proportions as Bonneville. So A. E. Pace, superintendent for this work, was faced with the neat little problem of providing an alternative course of action.

This alternative was driving a whole new row of piles inside the tipped section, a much more costly procedure, so it was considered worth while to gamble on being able to pull the piles back. It so happens that this time they lost, and the work of driving new piles is now practically complete.

Now after the water has gone down, the tilted piles will be pulled, or if it is impossible to get them all up, there will be another job for the two divers who are under contract to the company, to go down and cut them off level with the bottom with a hydrogen torch working under water.

New Pres. for Penn-Dixie

John A. Miller, formerly Chairman of the Board of Directors of the Penn-Dixie Cement Corp., New York City, has been elected President of the company to succeed Blaine S. Smith who recently resigned to become President of the Universal Atlas Cement Co. Victor N. Roadstrum has been elected Chairman of the Board and George Kilian, who has been acting as Secretary and Treasurer, has been appointed also as Assistant to the President.

Walter S. Wing, General Sales Manager, and W. H. Klein, General Operating Manager, have been elected Vice Presidents and members of the Board.

New District Manager for American Hoist & Derrick

J. L. Praytor, who was formerly associated with the American Hoist & Derrick Co. for a number of years, has recently been appointed District Manager for that company in the south and southeastern section of the United States, including the states of Alabama, North and South Carolina, Georgia, Florida, Tennessee, Kentucky and Mississippi. His office will be located at 4601 First Ave. North, Birmingham, Ala.

Save This Date!

The next annual Convention and Exhibit of the American Road Builders' Association will be held the week of January 11, 1937. While the place of the meeting has yet to be selected, it will be well for contractors, state and county highway engineers to keep that date in mind.

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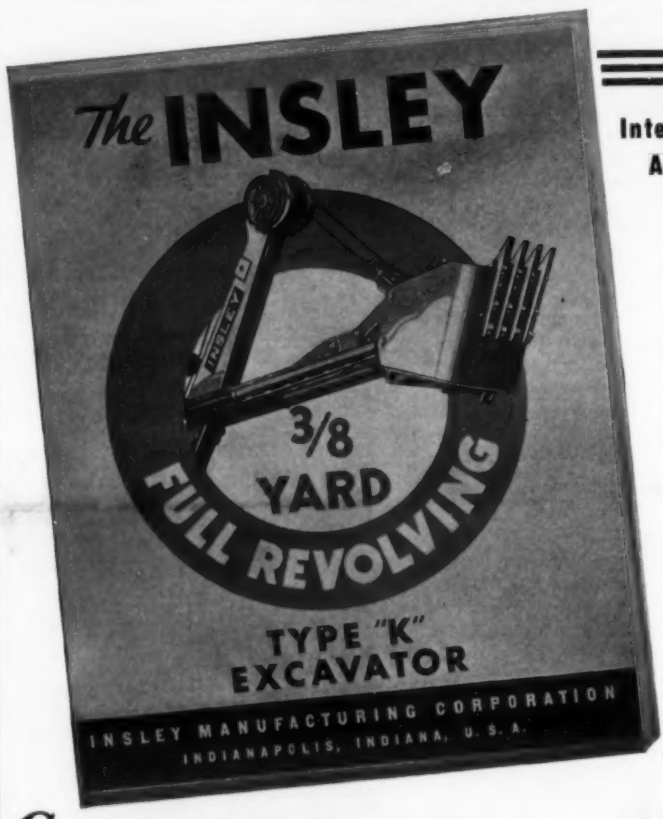

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ROAD-ROLLERS
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IRONER ROLL - SCARIFIER - GRADER BLADE
SIZES.—6, 7, 8, 10, 12, 15 TONS
WRITE TO:
THE HERCULES CO.
MARION, OHIO, U. S. A.

Better Roadsides Is Florida Plan

Sunshine State Sells Value of Beautification in Increased Safety and Lower Maintenance Costs by Well-Worded Leaflet

THE program of "Roadside Improvement" being undertaken in Florida is nothing but a better class of construction and better maintenance procedure, says T. B. Massie, Roadside Improvement Engineer for the State Road Department of Florida. He has found that the term "roadside improvement" and its associations of the past under the term "beautification" would hardly warrant much support from a business man. Accordingly, Florida's road department is driving home the four points in their program by a well-prepared leaflet, by which they are winning respect for the work and public approval of adequately financing further highway programs.

Safety

Under this first and very important heading, the Roadside Improvement leaflet states:

"Our one greatest purpose is the reduction of traffic accidents.

"Shoulders wide enough to allow the parking of the largest vehicles clear of the pavement, to accommodate horse-drawn vehicles and pedestrians. It is proven by 'before and after' accident rate figures that this one feature—the ample shoulder—will about halve the accidents.

"Flat front and back slopes and a side ditch of minimum depth, protected against erosion, will allow the car forced off the road to obviate being wrecked.

"Flat back slopes and a properly ordered right-of-way assure the maximum sight distance. The building line and advertising held back by our wide right-of-way eliminate blind spots and driver distraction. Generous lay-outs at road intersections, free of these obstructions, create greater safety."

Provision for Future

"The prime purpose of the wide right-of-way is to provide room for future development in pavement requirements. As any country becomes more densely populated, more pavement width must be provided. It is too late to secure additional right-of-way when the time arrives for widening.

"The present trend of thought is toward 'divided lanes.' Two 20-foot pavements, separated by a parkway, will handle more traffic and with greater safety than one 40-foot pavement. Movement is all 'one way,' obviating head-on collision. Headlight glare is eliminated. Traffic will not stay in its proper lanes on a 40-foot pavement.

"At present we have a small mileage of divided lane, located on U. S. 1 on the lower east coast. The great German system now building is of this type—two 24-foot 6-inch pavements separated by a parkway. Because of the accident rate, one state is now spending a large sum to convert one of their 40-foot pavements into a divided lane type.

"On our present construction, where we have secured a 200-foot right-of-way, we place the initial pavement off the true center, thereby leaving room for progressive stages of development as traffic density or traffic safety demand."

"On the re-working of the old mileage, we frequently have had to accept the wider right-of-way equally divided on both sides of our center line, although we would prefer the off-set manner. This is due to the fact that all such right-of-ways have been a gift. However, now that the experimental stage is over with and the idea has proven sound, we are giving serious study to the matter of providing these properly off-set wide right-of-ways to the entire old mileage. We will try to anticipate just what is needed in the way of a generous right-of-way lay-out between the control points on the routes."

Lowered Maintenance Costs

This is a problem which every maintenance department is trying to solve. According to the engineers of Florida's State Road Department, maintenance costs in highway work are exactly as they are in other lines of business. They are in direct proportion to the class of construction—the better the construction the lower the maintenance costs.

(Continued on page 37)

For Economical Placing
USE
MALL CONCRETE VIBRATORS
Gas Engine Air Electric

Proper vibration with MALL vibrators enables you to use less water and sand, giving a denser, stronger concrete; also, gets concrete in closer bond with reinforcement and eliminates pockets and expensive patching. MALL vibrators do the work efficiently because each is designed for a certain type of job with rugged electric, gas engine or air driven power units.

Write for bulletins and give full description of job—depth and width of form, amount of reinforcing steel, etc. We will gladly recommend the type of unit best suited for YOUR work.

MALL TOOL COMPANY
7743 South Chicago Avenue Chicago, Illinois
Offices in all Principal Cities

Get
CLEAN SAND and **GRAVEL** with

EAGLE WASHERS

Screw and Paddle type machines to meet particular washing and cleaning problems in sizes to suit capacity requirements. Send for bulletin W2 for complete information.

EAGLE IRON WORKS
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BLAW-KNOX

Points the way to profitable road building

The use of Blaw-Knox Road Building Equipment provides the short cuts to economy which are essential to profits in today's scheme for building roads.

How will this equipment fit into your road building operations?

Just ask Blaw-Knox!

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Offices and Representatives in Principal Cities

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STEEL FORMS FOR GENERAL CONCRETE CONSTRUCTION
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STEEL BUILDINGS
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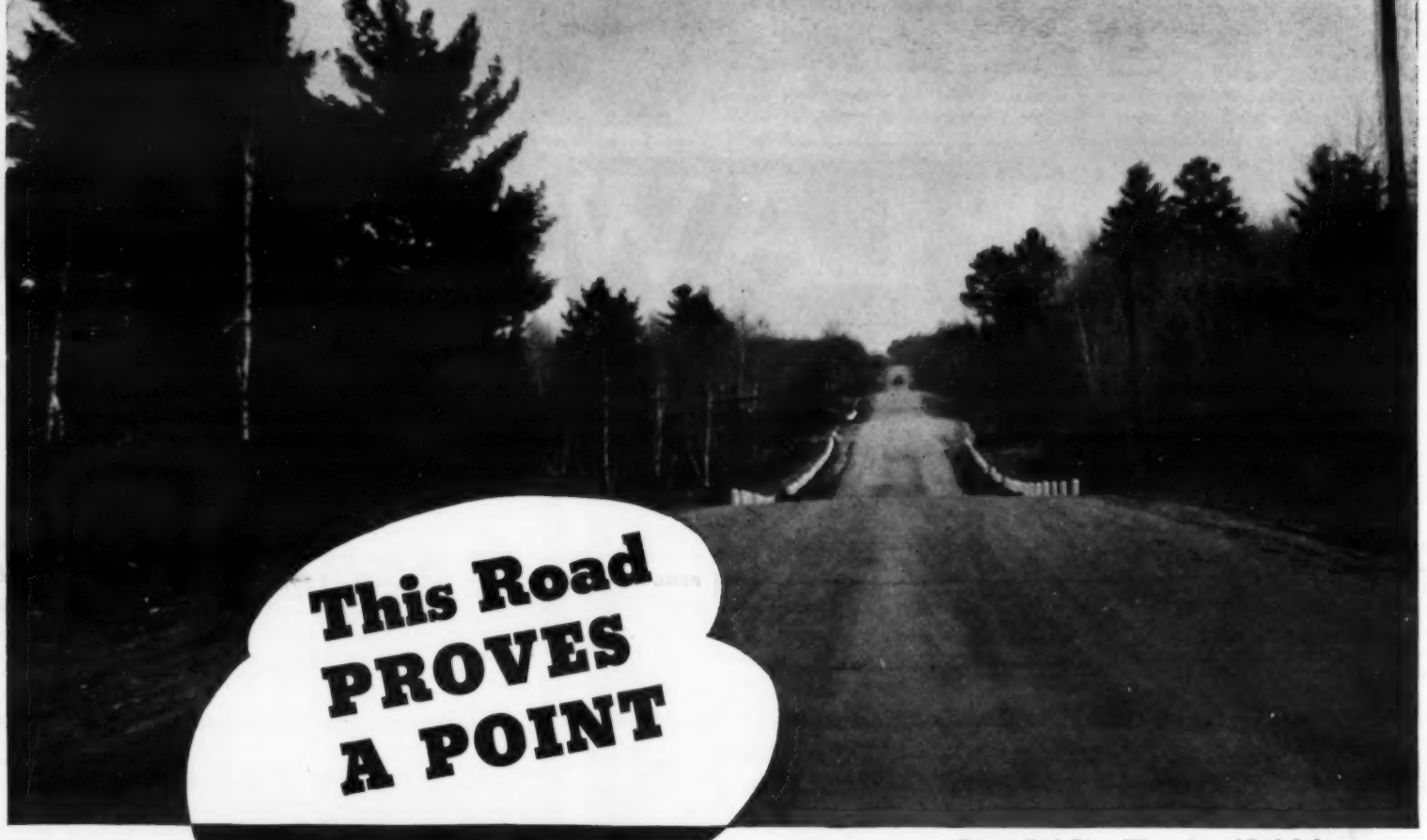
Greece Plans to Complete Unfinished Highways

Responsibility for highway construction activities in Greece is being concentrated in the National Roadbuilding Fund, a branch of the Bureau of Public Works in the Ministry of Communications, according to a recent report from the U. S. Bureau of Foreign and Domestic Commerce.

In July 1934 an agreement was signed by the Greek Government and the Prometheus Financial & Technical Corp. for the completion of 1,031 miles of highways which had been abandoned half-finished when the extensive 1928 road-building program was discontinued in 1932. The new scheme was to be completed over a period of 3 years and its cost was estimated at about $5,225,000. The necessary funds were to be advanced by the Government from credits placed at its disposal by the Bank of Greece and repayable from budgetary appropriations. Operations were started immediately and by the end of March 1936 approximately 226,000,000 drachmas ($2,125,000) had been spent.

Between January and March 1936 two internal loans totaling 1,000,000,000 drachmas (about $9,500,000) were contracted for by the National Roadbuilding Fund, to be used over a period of five years for carrying out a rather more comprehensive road-building program. On March 30, 1936 the loan agreement of 1934 was cancelled and the so-called Prometheus project became a part of the national road-building program to be financed from the proceeds of the new loans.

The Prometheus company will continue to operate as contractors on a 1½ per cent fee basis. The total amount of money now available for road building over the next five years is about $9,000,000 and when the entire program is completed, more than 1,500 miles of new roads will have been added to Greece's present network of highways.



Between Eagle River, Wisconsin, and Eagle Lake.

WHEELS of business glide more smoothly, more swiftly and more surely over improved highways and secondary roads, guaranteeing more profitable and better living to communities with *road-paving foresight.*

Vilas county, Wisconsin, is in the "Heart O' The Lakes" district, called the most concentrated lake region in the world. Few localities have been so successful in the competition for tourist business. Tens of thousands of cars visit this region every year, most of them in summer, but an annually increasing number also for hunting and other winter sports.

Good roads are important the year around, and at low cost Vilas county has provided good roads, with Stanolind Liquid Asphalt. Inexpensive to construct, three years have passed without need of *one* repair.

Your community needs economical pavements like this. For full information on construction details and costs call your nearest Standard Oil (Ind.) office or write.

Copr. 1936, Standard Oil Co.

ASPHALT goes farther

STANDARD OIL COMPANY
910 S. MICHIGAN AVE. (Indiana) CHICAGO, ILL.

IN LONG-WEARING ROAD MILES . . . IN DISTRIBUTION OF LABOR . . . IN TAXPAYER SATISFACTION

Now Is the Time To Prevent Frost Damage

(Continued from page 22)

may be raised many times as much as it would normally be raised if the soil with the water it held was frozen without additional water entering. In fact, in northern Michigan, Wisconsin, and Minnesota there may be 2 or more feet of heaving by this method. Of course, this is sufficient displacement to cause serious failure in the pavements."

Creating Drainage for Subgrades

The use of porous sub-bases of gravel, stone, sand, slag, cinders, or other porous material is desirable where the subgrade consists of a clayey soil of high capillarity from which detrimental water cannot be drained. It should be remembered that a porous sub-base, unless itself adequately drained, may simply serve as a reservoir and thereby aggravate the instability and frost action. The use of porous sub-bases should ordinarily be confined to those areas where dense, tight subgrades exist and where the ground water level cannot be sufficiently lowered to a depth greater than the height of the capillarity rise.

Drainage the Solution

The fundamentally proper way of stabilizing a subgrade is by drainage. The methods open for use are surface ditches or pipe enclosed ditches which are satisfactory if of adequate size and of such gradient that the water does not stand in them. They operate if the soil is pervious and coarse grained. If, on the other hand, the soil is impervious these ditches will do little to lower the ground water and drain it from the subgrade.

French drains consisting of a trench filled with coarse rock, usually of one-man size, provide a pervious "wall" to intercept free ground water. They are of limited durability and economy as they are expensive to maintain.

Pipe subdrains or underdrains consisting of a trench with a pipe at the bottom and which will admit water readily and serve as a channel for the free flow of water, and the trench backfilled with porous or pervious material serve to intercept underground water or lower the water table. Details of design, location, depth of pipe, slope, size of pipe, openings in pipe, are found in a complete discussion of this subject under the title "Subgrade Drainage for Modern Roadways," Bulletin H-36, from the copyrighted text of which this material has been abstracted with permission of the publishers, the Armco Culvert Manufacturers Association, Middletown, Ohio.

Identification of Tools Saves Time and Money

Marking the owner's name on tools and equipment to prevent theft, marking sizes or uses on tools and identifying spare parts in the stock room are some of the uses for contractors of the Ideal electric marker, a new portable tool for marking on practically any material, metal or non-conductor, which is made by the Ideal Commutator Dresser Co., 1503 Park Ave., Sycamore, Ill. Legible and permanent records can be made quickly and easily on all metals and their alloys, dies, tools, plates, shapes, rods, hard rubber, plastics, fibre and similar materials.

The marker is hand-size, 6¾ inches overall, weighs 2 pounds and is easily handled. It makes permanent lines, cut into the surface, that can not be removed by ordinary wear. It operates on 110-volt 60-cycle alternating current and consumes approximately 75 watts. It can also be furnished for other standard voltages and frequencies. The unit comes complete, ready for use, with a 6-foot cord with plug and on-off switch.

There Were Many Highways Listed on State Detour Maps As "Impassable Due to Frost Damage" Last Spring. Here the Rut Measured 6 Inches Deep.

Work on Indiana Roads Employs Over 9,000

More than 9,000 men have been directly employed on construction and improvement contracts for the Indiana State Highway Commission, according to reports to the Commission by contractors, James D. Adams, Chairman of the Commission announced recently. These reports, showing 9,218 men directly employed by contractors, do not include the additional thousands employed in shoulder widening and similar WPA projects along the state highway system nor do they include the regular employees of the State Highway Commission.

Aided by favorable weather conditions the 1936 construction program of the Indiana State Highway Commission made exceptional progress during June and July. Many of the projects on which work was started during the fall and winter months have been completed and others are being completed almost daily.

The major part of the construction program in operation this year is being financed entirely or in part with Federal funds and employment on such project is governed by Federal regulations. Approximately two-thirds of the men working for contractors on highway construction were employed through the U. S. Employment Service and most of the remaining third were taken from relief.

New Light-Weight Wagon for Fast Rock Drills

A new light-weight wagon mounting for fast, powerful rock drills, which fills the gap between the large I-R drills and the hand-held Jackhamer, has been announced by the Ingersoll-Rand Co., 11 Broadway, New York City. It will handle 20-foot steels and will accommodate a 6-foot steel change.

This new unit is versatile, with a positive feed at any angle. Feed is by air motor, with a range of feed pressure from 1 to 1,000 pounds. A self-locking worm drive permits feeding the drill up to the rock exactly as with a hand-cranked drill. The mounting can be equipped with pneumatic tires for easy moving from one place to another.

Bulletin 2253 contains complete information on this new drill wagon mounting and may be secured direct from the Ingersoll-Rand Co. by mentioning this magazine.

Le Tourneau Enlarges Plant

Marking the third plant enlargement in little more than a year, R. G. Le Tourneau, Inc., manufacturer of Carryall scrapers and other large-capacity dirt-moving equipment, has started the construction of an addition to the Peoria, Ill., factory which will more than double its present size and capacity, giving the Peoria plant a total length of 1,200 feet or an area of 174,000 square feet.

The present capacity of this plant is rated as three scrapers a day, supplemented by the various other Le Tourneau units. The enlarged capacity will be seven scrapers a day, plus a larger number of other units.

R. G. Le Tourneau, President of the firm, began contracting on land leveling and road construction in 1918. Dissatisfied with the equipment then in existence, he began revamping it with cutting and welding torches to fit his ideas of capacity and operation. This soon resulted in the start of his own plant to produce equipment for use on his own large jobs, from which grew the manufacturing organization of R. G. Le Tourneau, Inc., of today.

New Lincoln Distributor

The Industrial Supply Co., Salt Lake City, Utah, has recently been appointed by the Lincoln Electric Co., of Cleveland, Ohio, as distributor for Lincoln Shield-Arc welders, Fleetweld and other electrodes and welding accessories in the Salt Lake District. A. B. Kemp has been made Manager of the Welding Division and will be available for consultation on welding problems.

BUYING A PUMP?

INSIST ON:

- Faster, 100% Automatic Priming,
- Greater Efficiency in Any Size, at Any Lift,
- Thousands of Hours of Heavy Duty Service.
- Cut Your Costs with "Sure Prime" Pumps—2" to 10" Sizes, Capacities 7000 to 200,000 G. P. H. Send for New Catalog and Prices.

THE JAEGER MACHINE CO.
701 Dublin Ave., Columbus, Ohio

JAEGER

No Diesel can be any better than it's FUEL SYSTEM

Read the record

Ask for booklet FS100

CUMMINS—DIESELS

CUMMINS ENGINE COMPANY, COLUMBUS, IND.

IMPROVED FEATURES •• NEW DESIGNS •• ADDED REFINEMENTS ••

in Owen Buckets

Type "S"

Owen buckets have been improved each year for the past twenty-five years, but in no similar period have the improvements equalled those made during the past three years. New principles, advanced designing, better alloys and welding have been contributing factors.

THE OWEN BUCKET COMPANY
6030 Breakwater Avenue • • • Cleveland, Ohio
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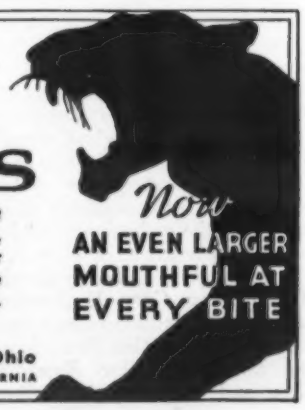


Now AN EVEN LARGER MOUTHFUL AT EVERY BITE

Construction of Santa Clara Dams

(Continued from page 20)

cubic foot Ingersoll-Rand air compressors with jackhammers, three 3-cubic yard Autocar dump trucks, two Caterpillar diesel Fifty tractors, one equipped with bulldozer, and one 8-cubic yard Le Tourneau Carryall scraper. The California Concrete & Steel Pipe Co. had the subcontract for four reinforced concrete inverted siphons on this conduit.

Coyote Dam

The Coyote Dam, the largest of the District's dams, creates a reservoir with a storage capacity of 30,000 acre-feet. It lies about 6 miles east of the town of Morgan Hill. The Coyote Dam has a center or impervious section with 2 to 1 side slopes and 60-foot crown. On both faces of this section are gravel fills tapering in horizontal thickness from about 120 feet at the bottom to 10 feet at the top. Over this gravel on both faces of the dam, rock fill is being placed of the same general thickness as the gravel. This makes the outer slopes average about 3.5 to 1 and the total width of the crest of the dam 100 feet except at the west end where the crest is 160 feet.

The Coyote dam and spillway is under contract to the Macco Construction Co. of Clearwater. About 40 per cent of the earth was moved with buggies and tractors. The earth and rock moving equipment included five 25-cubic yard buggies, two Le Tourneau bulldozers, one 6-section and one 2-section sheepsfoot roller, three Cletrac diesel 80's, two Caterpillar diesel Seventy-Fives, two Caterpillar Sixties and one Allis-Chalmers Model L tractor with bulldozer. Several of the 25-cubic yard buggies were worked under two Northwest shovels with 2½-yard buckets. Other equipment included one Thew 1¼-yard shovel, one 450-cubic foot Ingersoll-Rand air compressor, one Gardner-Denver 450-cubic foot air compressor and one 220-cubic foot Le Roi-Rix 6 air compressor, fifteen 6-cubic yard Mack dump trucks and five 6-cubic yard International trucks. All concrete was handled with two 2-yard transit mixers. At this date the dam is complete except for about 80,000 cubic yards of rock facing and completion of the reinforced concrete spillway lining. Construction has been suspended temporarily until the water in the reservoir which is nearly full may be lowered. Work will be resumed about September 1, 1936.

Guadalupe Dam

A. Teichert & Son handled about 80 per cent of the earth for Guadalupe Dam with tractors and Carryall scrapers. The balance was hauled with trucks loaded with a P & H 1½-cubic yard shovel. The equipment included four 12-cubic yard Le Tourneau Carryall scrapers, one heavy-duty rooter, one Le Tourneau bulldozer, two 2-section sheepsfoot rollers and seven Caterpillar diesel Seventy-Fives and one 310-cubic foot Ingersoll-Rand air compressor.

Stevens Creek Dam

The stripping and foundation excavation for Stevens Creek Dam was done by McDonald & Bohnett, of San Jose, who employed both Carryall scrapers and a dragline. The entire embankment was subcontracted to Crow Brothers, who moved the earth with Carryall scrapers and tractors. This was an exceptionally fine set-up for dirt-moving, borrow pits were available at all four corners of the embankment and the material was a gravelly clay formation which worked well. Seven 12-cubic yard Le Tourneau Carryall Scrapers, two Le Tourneau bulldozers, one heavy-duty rooter, four 2-section sheepsfoot rollers and nine Caterpillar diesel Seventy-Fives and one Caterpillar Sixty were used. The dragline used by McDonald & Bohnett in foundation excavation was a 1½-cubic yard Northwest.

Vasona Dam

The Vasona Dam consists of two 28-foot levees with a center section 210 feet long of reinforced buttress-type spillway dam with radial gates. The levees at each end of the spillway section are of rolled clay fill on the upstream sections and gravel fill for the downstream sections. The fill materials were moved from the borrow pits with two 8-cubic yard Le Tourneau Carryall Scrapers drawn with Caterpillar diesel Seventy-Fives. The earth work on the dam was subcontracted to Geo. R. Patterson and E. H. Rider of Stockton. Carl N. Swenson, of San Jose, the general contractor, constructed the spillway section and gates and a 2.5-mile 75-second-foot canal leading northwesterly from the Los Gatos Creek and terminating in San Tomas Creek. The canal excavation was subcontracted to Biasotti, Willard and Biasotti of Stockton, who used a Northwest dragline, with 1½-cubic yard bucket. Swenson's concrete equipment consisted of one White truck mounting a 1-cubic yard Oxweld-type transit mixer, numerous miscellaneous small pumps, power circular saw for forms and one small Ingersoll-Rand air compressor for small tools.

Almaden and Stevens Creek Roads

In addition to the six dams and canals, two new roads were built by the District to take the place of portions of two county roads that had to be abandoned with the construction of the reservoirs. The two new roads, located at Almaden and Stevens Creek Dam sites, start from the original county roads a short distance below the dams and continue around the reservoirs slightly above the high water contours. The new roads join the old roads again at the upstream ends of the reservoirs.

Carl N. Swenson was the contractor for the Almaden road and D. McDonald for the Stevens Creek Road. The California Corrugated Culvert Co. furnished the corrugated metal culvert pipe for both road jobs, as well as several Calco radial gates that were used on the outlet structures of two of the dams and a number of Calco slide headgates of various sizes.

Included in the culvert pipe for the Stevens Creek road job was a full-circle Armco Multi-Plate culvert, 15 feet in diameter and 85 feet long.

Personnel

The District's organization and officers are as follows: S. D. Farrington, President and Director, Division 1; Wm. F. Noethig, Director, Division 2; R. P. Van Orden, Director, Division 3; J. Fred Holthouse, Director, Division 4; Harry G. Mitchell, Director, Division 5; Reginald L. Parry, Director, Division 6; S. W. Pfeifle, Director, Division 7; Leroy Anderson, Secretary; Herbert C. Jones, Attorney; Fred H. Tibbetts, Chief Engineer.

Laying a 5-Mile Water Line in Arkansas. Note the Trestles Used for Lowering the Pipe.

Construction of 5-Mile Water Line by Man-Power

The contractor for a 5-mile water pipe line between the City of Fort Smith and the Village of Alma, Ark., a PWA project, was obligated to utilize man power for the pipe installation.

He devised a clever system of trestles over the ditch, and by means of ropes snubbed around the top bar of the trestle, was able to lower gradually the entire string of 8-inch Armco spiral welded pipe into the ditch. After the pipe was snubbed up to the trestle, three men with a fulcrum constructed on a wooden block raised the pipe sufficiently to permit the removal of the skid, and then lowered the pipe on an angle into the ditch. As the pipe on the rear end reached the bottom of the ditch, that trestle was released.

New Cleats for Crawlers Provide Two-Way Traction

A new cast cleat, to be attached to Bucyrus-Erie crawlers on jobs where increased traction is desired, has recently been announced by the Bucyrus-Erie Co., South Milwaukee, Wis. A unique cross-construction provides a two-way traction that prevents slipping when moving forward and sliding sidewise when on soft hillsides.

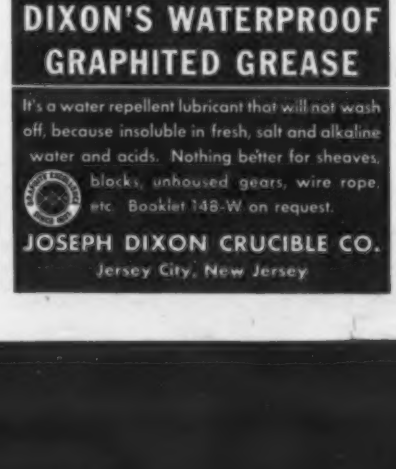
These cleats may be used on every link, or on every second, third or fourth link, depending on the ground requirements. They are easily attached, the curved ends of the two sections hooking over the outside edges of the links and the two parts being bolted together. A three-point contact is designed to provide perfect seating of the cleats and prevent working loose. They are removed merely by unbolting and lifting from the links. Sizes are available to fit many of the smaller Bucyrus-Erie machines.

ROCK DRILLS
PAVING BREAKERS

Sharpening and Shanking Tools
Hose Fittings and Hose
Drill Steels
Detachable Bits

The first rock drill manufacturer in the United States announces a new line of Rock Drills and Paving Breakers embodying the latest materials and heat treatments as well as new designs.

HARDSOCG WONDER DRILL CO.
227 S. Benton St. Ottumwa, Iowa



MAKES WIRE ROPE LAST LONGER

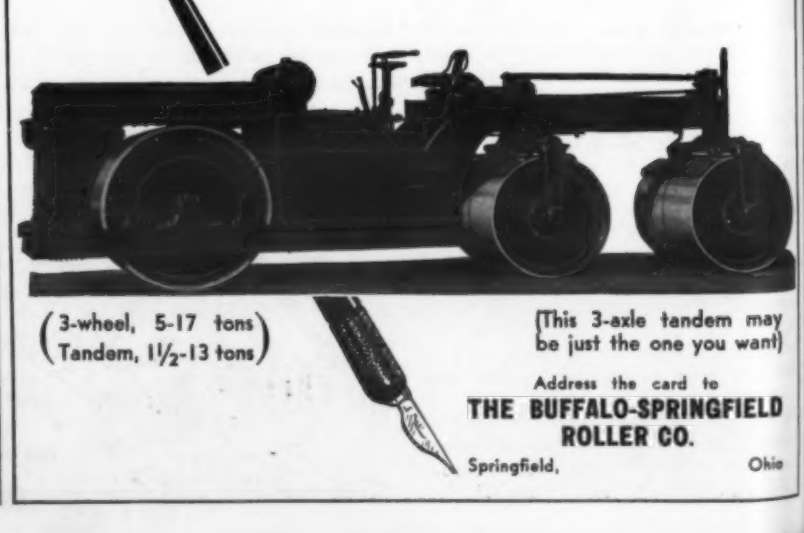
DIXON'S WATERPROOF GRAPHITED GREASE

It's a water repellent lubricant that will not wash off, because insoluble in fresh, salt and alkaline water and acids. Nothing better for sheaves, blocks, unhoused gears, wire rope, etc. Booklet 148-W on request.

JOSEPH DIXON CRUCIBLE CO.
Jersey City, New Jersey

Just write on a post-card
"10-ton 3-wheel"

(or whatever other size and type of roller interests you) and we'll send you printed matter on that size and type promptly, without obligation.



(3-wheel, 5-17 tons
Tandem, 1½-13 tons)

(This 3-axle tandem may be just the one you want)

Address the card to
THE BUFFALO-SPRINGFIELD ROLLER CO.
Springfield, Ohio

Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

Damage for Wrongful Discharge of Employee

"You are fired!" "We ask for your resignation." There may be a difference between these expressions from a standpoint of politeness. But, in legal effect, they mean about the same thing.

If the object of the "sack" has an unexpired contract for employment for a certain term, his mind is apt to run in the direction of damages.

Light on this subject is shed by a decision of the Kansas Supreme Court (8 Pac. 2d, 346), the substance of which is as follows:

Mere expression of dissatisfaction by an employee with the salary or wages received does not justify his discharge on a theory that he will not be able to render loyal service to his employer.

Where an employee was induced to move from Racine, Wis., to Wichita, Kans., to take charge of a branch of his employer's business, under a five-year contract, and was discharged without legal excuse after serving four and one-half months, he was entitled to damages based on the agreed salary rate up to the time that he secured new employment elsewhere. He was also entitled to expense reasonably incurred in traveling to other cities in search of employment. Considering the circumstances of this case, travel as far as Fort Wayne, Ind., was not unreasonable. But the discharged employee could not take a world tour at the expense of his old boss. In fact, in this case he could not have traveled as far as Los Angeles or New York. Nor was he entitled to reimbursement for expenses in moving from Racine to Wichita and back again.

Liability Policy Coverage

If a contractor's employee, in the course of his employment, should so far lose his temper as to tap a business visitor on the head with a pick handle, or otherwise assault him, there would be little or no ground for denying the contractor's liability in damages, assuming that the assault was unprovoked. But a glance at the law reports show that it might be very doubtful in any one of about 45 states whether a standard form of liability policy would entitle the contractor to indemnity.

A decision of the Mississippi Supreme Court (127 So. 555) declares that an unprovoked assault committed by an employee in the course of his employment constitutes an "accidental injury" of the person assaulted, within the provisions of a policy indemnifying the employer against liability for accidental injuries.

In such cases the insurance companies have taken a position resembling that of the Arizona cowboy, who when he admitted having been bitten by a rattle-snake, after having stated in an insurance application that he had never had an accident, was asked if he did not call that an accident. He replied: "Heck no! The snake done it on purpose."

The Mississippi court takes the view that an injury is accidental if it comes to the victim through external force and without his choice or provocation. But the Ohio and Illinois courts have taken the opposite view (161 N. E. 278 and 213 Ill. App. 334), holding that assaults of this kind are not "accidental."

This brief discussion may serve to suggest to the contractor that he should make sure either that his employees have no bellicose propensities or that his indemnity policies are so worded as to protect him.

Universal Atlas Cement Elects New President

Blaine S. Smith, who has just resigned as President of the Penn-Dixie Cement Corp., of New York City, will become President of the Universal Atlas Cement Co., of Chicago, a subsidiary of the United States Steel Corp., effective September 1. Mr. Smith succeeds B. F. Affleck, who has retired to devote his time to private interests after serving as President of the company since 1915.

Mr. Smith was associated for more than twenty years with the company he will now head, previous to his presidency of the Penn-Dixie Cement Corp. He is widely known throughout the cement industry and in the construction field, having been active for many years in the Portland Cement Association, of which he was President in 1925 and 1926.

Who Must Prove Cost of Remedying Defective Job?

"It is true, Owner, that the contractor did not construct that drainage system strictly according to contract," said a judge. "But the defects were not substantial and you are not entitled to any credit for the cost of making them good, because you have failed to prove the reasonable cost of so doing."

"You're wrong," declared a judge on a higher bench to the first judge. "The burden of proving the cost of remedying the defects is on the contractor, not owner."

The following are the exact words of the Appellate Division of the New York Supreme Court in the case of Blanchard v. City of Saratoga Springs, 271 N. Y. Supp. 573:

"He who relies upon substantial as contrasted with complete performance must prove the expense of supplying the omission or he fails in his proof, for he cannot recover for full performance when a part of the contract is still unperformed. Unsubstantial defects may be cured, but at the expense of the contractor, not the owner. But the contractor cannot recover the entire contract price when defects or omissions appear, for he must show, not only that they were unsubstantial and unintentional, but also the amount needed to make them good, so that it can be deducted from the contract price and recovery had for the balance only."

Claim for Extras Denied

"When the plans and specifications for a job are changed to increase the work to be done, after bids have been received but before the contract has been awarded, the contractor is in no position to claim extra pay for the added work, where there is no proof that the owner has been guilty of fraudulent concealment of the change in the execution of the contract." That is about what the United States Circuit Court of Appeals, Fifth Circuit, said in the case of Weber-Squires Corporation v. Firestone Tire & Rubber Co., 76 Fed. 2d, 711. In other words, it is up to the contractor to check the changes involved in the contract executed by him and he has no right to assume that he will be paid any more than his contract calls for.

The court said that it would tax credulity to believe that a contract would be signed and fully performed without the contractor discovering that the plans and specifications under which the contract was performed were substantially different from those on which he bid.

Contractor's Liability on Closed Highway Jobs

"While I was driving west on Highway 36 toward St. Joseph, Mo., late one afternoon, I drove past a detour sign, my car went over the embankment, and my wife was killed," complained a Missourian. And because a contractor was putting in a bridge at a point shortly beyond the place of accident and beyond a barricade, a jury and a circuit court judge in St. Joseph thought that the contractor ought to pay $2,000 damages.

"But," in effect the Kansas City Court of Appeals said (Howard v. Knutson, 77 S. W. 2d, 158), "it is not just that the contractor be held liable. The fact that he was building a bridge beyond the barricade did not make him liable for the condition of the highway between the detour sign and the barricade. That space was under the control of the state highway commission.

"If there could have been any circumstances under which the contractor reasonably might have been required to maintain lights on the barricade or a watchman there, no such situation was presented at the time of the accident. It was two hours before sunset, and the contractor had no reason to suppose that any motorist would disregard the detour sign and drive off the road. There is nothing to show that lights on the barricade there or a watchman would have obviated the unfortunate accident."

Users Report On Yardage Increases—

Read What They Say

A Contractor writes: **"It comes nearest to doing the work of a shovel bucket in rock with all the advantages of the dragline that I believe possible."*

From a gravel plant owner: **"Has increased our production at least 75%. To us the Page AUTOMATIC is the ONLY bucket for dragline work."*

A strip mine operator says: **"Can truthfully say that since putting on your AUTOMATIC we are stripping at least 50% more material." *From letters in our files.*

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Pickwick Dam

(Continued from page 25)

ing plant by a belt conveyor to a track hopper in the lock, from which it is carried in 4-cubic yard buckets on cars to a large Dravo crane which places the buckets in the forms where the concrete is placed by a crew of nine men with three Jackson 2-man vibrators. The mass concrete is designed for a strength of 2,500 pounds per square inch at 28 days and a slump of 1 inch.

The panel forms are very heavy as the lift poured at one time is 10 feet. Each standard panel is 10 feet high and 24 to 28 feet long, and weighs about 4,000 pounds. These panel forms are handled by Clyde whirler cranes with 95-foot gooseneck booms and 11,000 pounds capacity.

When work is under way in Stages II and III the concrete will be delivered by belt conveyor from the mixing plant to a hopper under the cableway, loaded into a 5-yard bucket and handled by the cable to a track hopper conveniently located in the cofferdam, and from this hopper it will be handled by buckets, trains, and cranes in a manner similar to the method now used in the lock. The cableway will be installed after the lock is completed. It will have a span of about 1,300 feet and lifting capacity of 11 tons.

To handle material from barges to mixing plant, mix the concrete, transport it to forms, and place it requires a total of 45 men per shift.

Personnel

A. E. Morgan is Chairman and Chief Engineer of the Tennessee Valley Authority; Carl A. Bock, Assistant Chief Engineer, has direct charge of all TVA engineering and construction, assisted by Theodore B. Parker, Supervising Construction Engineer, and Ross White, General Construction Superintendent. C. H. Locher is Construction Consultant, and A. J. Ackerman is Construction Plant Engineer. At the dam are A. L. Pauls, Project Engineer; R. F. Olds, Construction Engineer; and J. E. Walters, Acting Construction Superintendent.

Begin your snow fighting now. And don't miss the article on snow drift control in September.

An Adams Motor Grader, One of the Thirty International-Powered Units Operated by the State Highway Department, At Work on an Alabama Road

Maintaining State Roads in Alabama

There are approximately 5,640 miles of roads in the State of Alabama to be maintained by the state highway department. Of these approximately 3,475 miles are of gravel, chert, slag, sand-clay and top soil construction, 1,980 miles of paved roads and 186 miles of dirt roads. According to recent information from the state highway department, the annual cost of maintaining Alabama's highway is approximately $2,051,000.

All maintenance work is under the general direction of the State Maintenance Engineer and is divided into four geographical divisions. All work in each division, both maintenance and construction, is under the supervision of a division engineer. As a general rule, each division engineer has one assistant in charge of maintenance and one in charge of construction. Under the assistant engineer in charge of maintenance are supervisors, each supervising the maintenance work of about four counties. Under the supervisors are foremen, each having a section of from 20 to 50 miles, according to conditions encountered.

In addition to other equipment, each section is provided with one motor grader or one tractor drawing two road machines. Each motor grader maintains an average of from 25 to 30 miles, each trailer from 10 to 12 miles. "Floating" units, consisting of ditching crews operating a heavy-duty tractor and a heavy road machine, are employed to dig and clean ditches which can not be reached by the regular equipment.

Resurfacing crews as a rule have a power shovel and a fleet of dump trucks operating from a conveniently located material pit. Rock crushers are located where suitable rock is available, providing aggregates for road surfacing and bituminous work.

New Cable Accessories

Increased use of portable electric equipment has brought a widespread demand for satisfactory methods of connecting and terminating portable cable. To meet this need the General Electric Co., Schenectady, N.Y., has announced a line of portable cable accessories which includes high-voltage cable couplers and molded terminals for all voltages.

For use on high-voltage cable applications there is a newly designed coupler which provides a satisfactory method of connecting apparatus and lengths of portable cable together. These couplers, which are rated at 100 amperes, are particularly adapted for use with G-E 2,500, 3,500 and 5,000-volt Types SH and G portable cables. Provision is made in the coupler socket so that the shielding tapes or ground conductors of the cable can be brought out for grounding purposes.

The coupler socket and plug, both of which are equipped with a cover to prevent the entrance of dirt and moisture when the coupler is disconnected, are made of a malleable-iron frame with a malleable-iron end bell, which is bolted on. The current-carrying contacts are the sliding spring type and are enclosed and shielded by Herkolite tubing. There are four contacts, three of which are for the individual conductors of a three-conductor cable; the fourth contact is for the shielding braid or ground wires. In order that the coupler may be used as a connector between cable lengths, the end bells have been made interchangeable so that the plug-end bell may be put on the socket end in place of the socket-end bell and flexible connections made at each end of the coupler.

The new molded-rubber terminal is adaptable in cases where it is desirable to terminate portable or drag cable at the source of energy or at the load by means of a terminal which will hold the single conductors firmly together as a unit. The terminal is made of G-E R-387 tellurium compound and provides means of properly terminating ground wires and braided shields so that they can be correctly grounded.

Someone has said that automobile accidents are caused by the insane desire to arrive somewhere ahead of the other fellow in order to have more time in which to do nothing.

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through the pages of Michigan's new booklet picturing a score of uses for this fast convertible shovel and crane . . . It contains many on-the-job photographs of the Michigan being used as a shovel, crane, trench hoe, dragline, clam, etc., together with description and specifications. Here is the answer to the large operators' equipment shortage problem. For the smaller user, the Michigan represents a wide range of uses built into one piece of equipment. For every buyer, the Michigan offers the most in mobility, dependability and economy . . . Write for Bulletin C today.
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MICHIGAN AVENUE AT CONGRESS STREET
GEO. H. MINK Manager

RATES
WITH PRIVATE BATH $2.50
WITHOUT PRIVATE BATH $1.50

N. Y. Sewer Built Through Sand, Mud

(Continued from page 2)

There is a total of seven full size and one half plates in each ring. The breast boards against the face are all horizontal and held against the rings.

The mining crew consists of two miners, two helpers, and two muckers who shovel to the cars and move the cars until the Mancha locomotives were put in. Because of the size of the sewer, and because of operating under air, only one car at a time is used, but by use of by-pass switches located about every 100 feet car movement is speeded up. Space for these switches is made by omitting the concrete on two sides and by extra excavation. This leaves just enough room to put an empty car in on the siding.

Concreting

Koppel dump cars are used for mucking and for concrete. There are two lock men on each lock and the outer lock tenders handle the cars in free air. Blaw-Knox steel forms built especially for this job are skidded into place. Since the muck cars must operate at all times through the steel forms, they can have no braces or wheels.

The invert and 1 foot of each wall is poured first, one length ahead; that is, a distance of from 15 or 20 feet, as the forms are built in 5-foot sections. Then the forms for the remainder of the walls and the arch are set on the invert and jacked out against the wall.

The concrete is hand shoveled to the arch forms and hand tamped. The same crew which handles excavation places the concrete. They work four 6-hour shifts in air, each divided into 3-hour periods when the crew is changed. No. 1 crew works from 8 to 11, No. 2 crew from 11 to 2, and then No. 1 crew returns to work from 2 to 5. This is in accordance with the New York State Law governing the working hours of "sand hogs." The progress at each heading is about 5 to 20 feet of completed tunnel per day.

On this tunnel, in contrast with the work on Shaft No. 1 in rock, mucking is continuous, necessitating the presence of a truck at the shaft head at all times. The muck is hauled to Riverside Drive for disposal. The head frame at Shaft No. 2 is similar to that at Shaft No. 1 described in an earlier article, with a Clyde hoist on the special skip.

Grout pipes 1½-inch in diameter are inserted every 5 feet in the roof and a Ransome grouting machine is used at 60 to 70 pounds pressure or 50 pounds net pressure, taken off the tunnel operating pressure, for placing the grout.

The Compressor House

A compressor house located on First Avenue at 98th Street contains three 800-foot Chicago Pneumatic low-pressure compressors operating at 8 pounds pressure and one 600-cubic-foot Sullivan angle-compound compressor operating at 90 to 100 pounds pressure, all driven by General Electric motors. These compressors are housed in a substantial sectional steel building.

Humor and Pathos

We all know that contractors have their trials but occasionally there is a lighter side which brings a smile. The tunnel had been driven southward from Shaft No. 2 for several hundred feet on the east side of the street practically under the sidewalk. During this time a pressure averaging 11 pounds had been used which means that the ground surrounding the tunnel and possibly for some little distance carried pockets of air at this pressure. A wash boring contractor was hired by some individual to determine the foundation conditions in a lot about 200 feet from the heading. The lot was occupied by an automobile graveyard. The wash boring contractor chose the point between the wrecks of two early vintage motor vehicles and started work. When he reached a depth of some 15 feet, everything in the casing he was driving shot skyward and for a few minutes the owners of the junk yard and the boring contractor himself thought an artesian well or geyser had been unearthed on the Island of Manhattan. They had merely struck one of those pockets of air which are inevitable in the vicinity of a compressed air job. It is interesting to note that no drop was recorded in the tunnel pressure at the time the gusher came in.

The major portion of the early concreting at Shaft No. 2 was done in temperatures hovering between 15 and zero. This, of course, necessitated using heated concrete and the Transit-Mix Concrete Co., which supplied all of the concrete for this job, delivered inspected concrete at 170 degrees temperature. The normal temperature inside the tunnel was running about 110 degrees during this time because of the temperature of the concrete and the heat of the compressed air. Then about the last of February, for the first time in several months, the temperature jumped to the seemingly abnormal figure of 35 degrees but still the 170-degree concrete was delivered to the shaft and the tunnel temperature rose alarmingly to 120 and was going up when a hurry call to the inspector insured cold concrete until freezing time again.

Personnel

The Manhattan intercepting sewer from 73rd Street, Manhattan, to the Bronx is PWA Project 8044, financed by a $25.000,000 loan and grant to the City of New York by the Public Works Administration. The project was started under the direction of the former Commissioner of the Department of Sanitation, Col. Thomas W. Hammond; Walter D. Binger, Deputy Commissioner in charge of the Engineering Division of the Department; Richard H. Gould. Chief Engineer, Sewage Disposal and Intercepting Sewers; Herbert M. Hale, Engineer of Construction of the Ward's Island Work and Pincus Rizack, Resident Engineer. The contractor is the Rosoff Tunnel Corp., 1870 Second Ave., New York City, Fred W. Stiefel, Chief Engineer, J. M. Ribble, Construction Engineer; and Harry Talbot, Superintendent on air operations and Albert Wilson as Shaft Superintendent. A total of eighty men worked at Shaft No. 2.

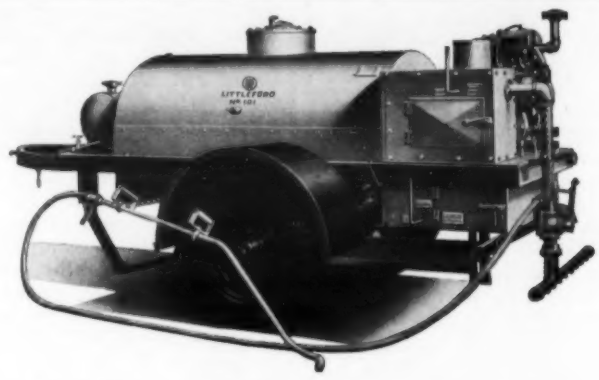
First Large U. S. Tunnel To Use Sodium Lights

Twenty 10,000-lumen General Electric sodium luminaires will continuously illuminate the 800-foot Tooth Rock Tunnel of the Columbia River Highway near Bonneville Dam, Ore. The golden light units will be supplemented by 1,500 and 1,000-watt incandescent lamps near the tunnel entrances during the daytime. Photo-electric tube equipment will turn the incandescent lamps on and off.

This will be the first large tunnel in the United States to be lighted by sodium units, and also the first to use supplementary portal lighting in this fashion.

Nine incandescent lamps over the right-hand driving lane at each end of Tooth Rock Tunnel will prepare the motorist's eyes for the change from bright daylight to the tunnel's main illumination. The incandescent lamps will be spaced at 10 and 20-foot intervals for the first 100 feet of the tunnel, producing a high level of illumination, and gradually tapering down to the normal level within. The sodium lamps will be spaced at 40-foot intervals and staggered through the tunnel.

Tooth Rock Tunnel, 34 feet wide with 4-foot sidewalks, was built by the U. S. Bureau of Public Roads since the construction of Bonneville Dam necessitated putting the Columbia River Highway through a mountain side.



The Littleford 101 Unit is the Answer to Your Black Top Maintenance Problems

The Littleford No. 101 Utility Sprayer is adapted to maintenance or repairs of all sizes on all kinds of black top roads. It heats any bituminous material quickly, in large quantities. It will apply material to new shoulders or widened curves through the spray bar on rear; or it will handle as many handsprays as you want for patching. It carries a load large enough to last all day. It trails easily, without slopping or upsetting.

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Heil hydraulic dump units are designed and built to perform under the toughest kind of dumping conditions . . . . Extra reinforcements where needed and great structural strength insure dependable operation . . . . No matter what your hauling problem is you will find exactly the type of equipment you need in the complete Heil line . . . . See your nearest Heil representative or address your inquiry to:

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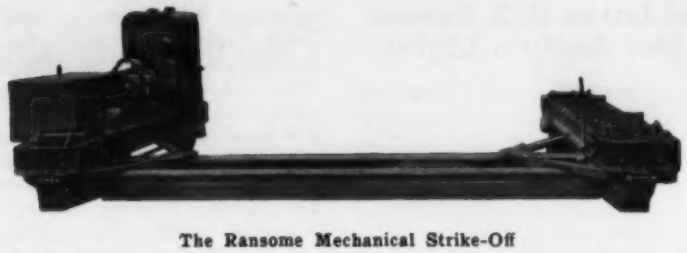


The Ransome Mechanical Strike-Off

A New Paving Accessory

A new mechanical strike-off, which is designed to cut hand strike-off costs as well as improve the quality of the work, has recently been announced by the Ransome Concrete Machinery Co., Dunellen, N. J. This machine is furnished in two types and two sizes, one type having an independent power unit and the other being operated by a clutch and drum on the paver. One size is for a 10-foot road and the other for 20 feet.

The blade of the machine is adjustable so that it may be set to strike off concrete to whatever depth the specifications call for. Once set, the blade continues to strike off concrete to the same depth at all times, keeping the reinforcing mats at a uniform distance from the top of the form. The blade can be used also to strike off the top of the concrete, making the work of the finishing machine easier and quicker. Crown pavements are readily handled by a simple adjustment of the blade.

The powered unit is chain driven from a 6-hp gasoline motor with gear reduction and a forward and reverse clutch. It operates at high speed so that the machine can strike off and then back up quickly to get out of the way of the paver bucket.

Both types can be operated on two lane pavements with one set of flat wheels to run on the pavement. Wheels on the forward end of the machine are well guarded to prevent stones from getting under them. The 10-foot unit with engine weighs 2,640 pounds and the 20-foot unit, 3,315 pounds.

This Ransome mechanical strike-off is illustrated and described in literature which may be secured direct from the manufacturer by mentioning this magazine.

New Portable Welder

A new welder, designed for extreme portability and sturdiness, has just been announced by the American Tractor Equipment Co., Oakland, Calif., manufacturer of Ateco earth moving equipment. This new welder is available either with or without a rigidly connected trailer under-carriage; there is a convenient bail attached directly to the main frame so it can be lifted into difficult locations by a crane or loaded and unloaded from a truck readily, and as a final means of portability, the ends of the main frame members are bored for insertion of bars for hand lifting.

Power is supplied by a 4-cylinder Ford industrial motor, developing 23 hp SAE rating, and equipped with radiator, electric starter and fan. The generator is of Ateco-Roe design and construction, with a capacity of 300 amperes. This generator is built especially for welding service and is designed for indefinite operation without exceeding a temperature of 60 degrees Centigrade.

The coupling between engine and generator is direct and flexible. There is no clutch. The control panel, of dielectric composition, carries a convenient hand-operated polarity switch, adjustments for controlling heat, voltmeter and meter. The 25-gallon fuel tank holds enough gasoline for more than eight hours of continuous operation, so that it is never necessary to shut down this welder in the middle of a shift to refill. The muffler is of cast steel of Ateco design. Cable lengths are of No. 0 extra flexible copper, heavily rubber covered and 50 feet in length. Heavy copper welding tongs, with replaceable tips, capable of handling rod up to ¼-inch in diameter are provided.

The welder is mounted on a sturdy welded channel frame, with a rigidly constructed canopy and removable side plates of No. 12 metal, which are pin-fastened and by slight readjustment can be locked with a padlock. There is space provided for storing welding helmets, leads, tongs, welding rod and any other necessary equipment inside the welder itself, so that everything necessary for even heavy welding jobs can be transported as one self-contained unit. Owing to the type of construction, this welder can be taken anywhere a truck or tractor can go, set down on the ground with little regard to irregularities and put to work at once.

On wheels, it weighs approximately 2,200 pounds; on skids, 1,850 pounds. The wheels are the standard automobile type, carrying regular automobile pneumatic tires of 4.75-19 size. The axles are heavy steel, made by Ateco, and welded rigidly to the welder frame to eliminate sidesway in towing the unit behind a truck

New Highway Guard Rail

The Wej-Lock highway guard rail, made by the Wej-Lock Co., Centralia, Mo., is a single strand fence, the springs at the ends of which absorb the shock of impact and keep the strand taut at all times and under all climatic conditions. When installed according to the manufacturer's specifications, Wej-Lock guard rail is guaranteed to stop any truck, bus or car. The recommended height for the Wej-Lock strand is 23 inches from the ground, which has been proved by tests to be the proper height for maximum efficiency and safety.

The fence is made of the best materials obtainable and heavy Wej-Lock cable ends are installed on the strand at the factory. The spring is made of high grade steel with 4-inch compression at 5,000 pounds. The cable end, tie bar, turnbuckle and spring cap are cast of certified malleable iron. The offset is pressed from 3/16-inch steel, has a 3 x 6-inch base and is attached to the cable and post by means of a ¾-inch flatted hook bolt. All bolts and rods are of structural quality steel with rolled threads and all fittings are hot dip galvanized.

Complete information on this guard rail may be secured by interested state and county highway engineers direct from the manufacturer by mentioning this magazine.

Oil-Mat Surface for County Roads

Johnson County, Ind., Reports on Methods of Construction and Maintenance of Low-Cost Roads

By IVAN CRAGGS,
Johnson County, Ind., Road Supervisor

THERE are in Johnson County approximately 60 miles of oil mat surfacing, 50 miles of which were constructed by scarifying the old gravel road to a depth of 2 inches and putting this loose material into a windrow on either side of the road. Approximately 0.3-gallon per square yard of A-50 or A-60 road oil was applied to the road bed as a primer. The loose material was again placed over the road, and to this was added approximately 0.7-gallon per square yard of A-70 oil, mixed and graded, spread evenly and rolled, producing a mat 1½ inches thick.

On account of the many kinds of material used in the old road, hardly any two sections were the same. The cost of this type of road was around $1,100 per mile. Bituminous material costs 7 to 8 cents per gallon applied.

At the time of construction, little or no consideration was given to drainage, and no consideration given to shoulder material on either side of the road to support and protect the edges of the mat. As a result, traffic has caused the mat to spread, and the edges are broken.

Recent Work

During the past few years approximately 20 miles of road were surfaced with road oil or S. C. 2 and S. C. 3. These roads were first brought to the required grade and cross-section and proper drainage was established. To the old road bed, approximately 0.2-gallon per square yard of S. C. 3 was applied as a primer. Then approximately 100 pounds per square yard of clean pit-run gravel was placed on the road and approximately 0.7-gallon per square yard of S. C. 3 applied, graded, mixed, and spread evenly over the road. The surface was then rolled, producing a mat 1½ inches thick. The cost was approximately $1,200 per mile.

We have a 3-mile section of road where an oil mat was constructed on the old road by first bringing the road to proper grade and cross-section and adding approximately 125 pounds per square yard of clean dipped gravel and adding sufficient S. C. 3 to this material to produce a mat approximately 2 inches thick without priming the old road. After three years we notice very little difference in these two types of road, except that where the prime coat was used, the road became soft in places.

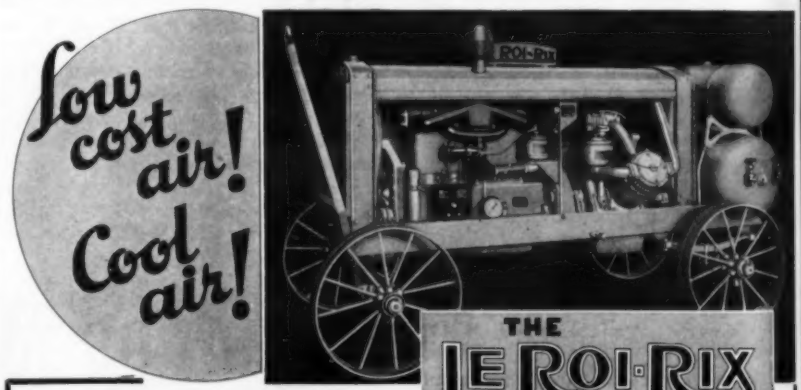
We have a 2½-mile section of road, surfaced to a depth of 2 inches, using washed gravel varying in size from ⅛ to ¾-inch and without a primer on the old surface. We believe this road type to be the best. It can be constructed at about $1,200 per mile of 18-foot width.

Honesty and Competence Count

Experience has taught us that in order to obtain good results, the contractor must be honest, competent, and must purchase his materials from reliable producers.

Many times here in Indiana we have paid dearly for work done by some "would-be" contractor who took advantage of the unskilled road superintendent and commissioners and we have therefore learned the advantage of having only reputable contractors work on our roads.

From a paper presented at the Twenty-Second Annual Purdue Road School.



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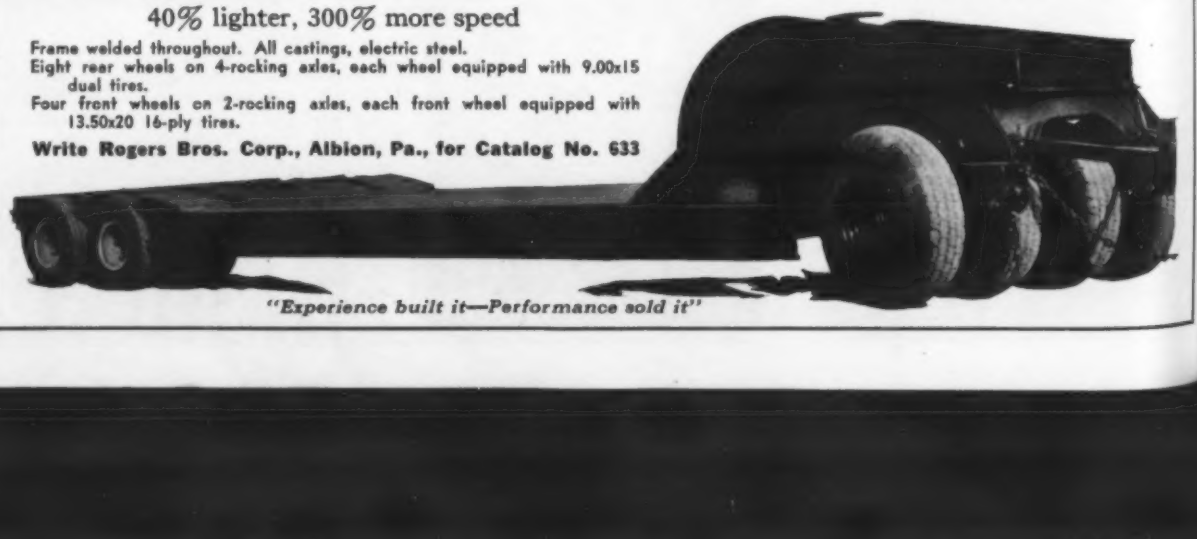
ROGERS New 50-Ton Pneumatic-Tired TRAILER

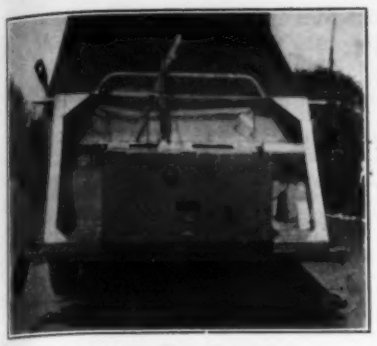
40% lighter, 300% more speed

Frame welded throughout. All castings, electric steel.
Eight rear wheels on 4-rocking axles, each wheel equipped with 9.00x15 dual tires.
Four front wheels on 2-rocking axles, each front wheel equipped with 13.50x20 16-ply tires.

Write Rogers Bros. Corp., Albion, Pa., for Catalog No. 633



"Experience built it—Performance sold it"



The Hy-Way Spreader

Self-Contained Spreader for Use with Dump Trucks

The Hy-Way spreader, made by Hy-Way Spreaders, Inc., 794 Fifth Ave., North Troy, N.Y., is a self-contained unit of the shuttle type, adaptable for use with any dump truck body. This machine, it is claimed, will spread the various materials used in ice treatment up to 25 feet in width, to any thickness desired, at speeds up to 25 miles an hour. For the various aggregates used on oil, there is a telescopic spreader board, used only to regulate the width of the spread, which is adjustable for a width of spread from 7 to 14 feet. Under ordinary conditions, the manufacturer claims that a cubic yard of material can be spread on oil surfaces in about 2 to 3 minutes.

This spreader is operated by one man who has full control of the thickness and width of spread, regardless of the truck speed, by opening and closing the tail-gate at will. The spread operates independently of the truck motor at all times, and is driven by a separate Briggs-Stratton air-cooled gasoline motor, with self-contained ignition, controlled by a hand throttle.

Complete details on this spreader are contained in literature which may be secured by interested contractors, and state and county highway engineers from the manufacturer by mentioning this magazine.

New FWD Tractor Truck for Heavy-Duty Hauling

A new 40,000-pound gross capacity tractor truck, designed to meet the requirements for a compact high-speed unit for heavy-duty hauling, has been announced by the Four Wheel Drive Auto Co., Clintonville, Wis. According to the manufacturer, a feature of this new T-40 is controlled power, provided by the better distribution of power and load through the use of a center differential and the distinctive location of the front axle.

This unit meets highway regulations restricting the length and axle weight of tractor and trailer units. The weight distribution of the tractor is 40 per cent on the front axle and 60 per cent on the rear. The tractor can maintain a road speed of 52 miles an hour on the level. The short overall length and standard wheelbase of 130 inches provides a short turning radius and ease of maneuverability.

The 125-hp motor has a displacement of 462 cubic inches and developes 324 pound-feet of torque. The transmission is of the 5-speed sliding gear type with overdrive and reduction of 7.3 to 1 in direct.

There are a number of safety features in this new tractor truck, including two separate and independent sets of brakes acting on all four wheels for quick stopping in heavy traffic and on hills. One set is the air-operated service brakes, the other the parking brakes which operate on all four wheels through the driving mechanism.

Complete specifications on this new unit may be secured direct from the manufacturer by mentioning this magazine.

Florida Has Unusual Plan for Roadside Improvement

(Continued from page 29)

Erosion is one of the greatest causes of costs in Florida as in many other states. Flat slopes, under grass, reduce this erosion. A rim or berm ditch when needed in certain cuts to protect the back slope against erosion will pay for its construction many times through the savings in maintenance costs, it has been proved in Florida. Other points in Florida's program are:

"Side ditches properly paved are no longer subject to erosion and the resultant constant repair.

"Guard rail is an item of continuous repair costs. By substituting flat-slope fills you eliminate the item.

"By applying these principles of roadside improvement to all maintenance operations you are not merely repairing damage, but you are finding out the cause of the damage and curing it for all time.

"The roadbuilding industry is too big to allow hand to mouth, short term economies, but should use those long term ones of commercial industry. In the matter of both new construction and the re-working of old mileage there are two main points: first, put into design thought on probable future development, thought on safety, and thought on turning out a class of construction that eliminates many of the old time maintenance costs—that's knowing what to do. Second, carry out this work in accordance with up-to-date, contractors' practice, through equipment and good management—that's knowing how to do it.

"Pavement maintenance is not the most serious item entering into costs. Costs are attributable mainly to elements lying without.

"On perfectly constructed earthwork practically nothing except mowing is left for maintenance, and this can actually be eliminated in time, through the establishment of low growing, better grasses instead of the usual rank growth."

Better Appearances

"On road work which includes the elements of design as set forth, appearances will always be satisfactory. The same elements that create safety, etc., create good, orderly appearance.

"The first step towards improving looks would of necessity be the securing of an ample right-of-way, whether it was to serve still another purpose or not. These right-of-ways, allowed to develop in native tree growth, and kept in an orderly condition, will really constitute a state park system over our several thousand miles of highways.

"Earthwork must be well designed, under grass cover, and protected against erosion scars to contribute its part in a permanent, satisfactory highway lay-out.

"As the state develops, and moneys become available, there is no limit to which further roadside improvement may be carried through planting, landscaping, etc., provided we have properly laid this elementary ground work.

"Florida has had probably 750,000 visitors this year. They come seeking pleasure and the unusual. It is very proper that we should attempt to give them, along with Floridans, the utmost in highway safety and good appearances.

"With new construction embracing these principles and with maintenance undertaking to overhaul the old mileage this job can be done."

Changes in Personnel at Hercules Powder Co.

Charles A. Bigelow, formerly General Manager of the Explosive Department of Hercules Powder Co., was elected Vice President and member of the Executive Committee at a recent meeting of the Board of Directors. William Robert Ellis, now Assistant General Manager of the Explosive Department, was elected General Manager to succeed him.

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¾ yd.	45
⅞ yd.	52
1 yd.	62
1¼ yd.	65

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Bulletins and Pamphlets

For free distribution to contractors, engineers and officials. Write for the catalogs you need.

The Record of a ¾-Yard Shovel

778 Complete details of the Lorain 40 ¾-yard shovel and the record of its performances on the job is contained in a booklet "Performance Is Convincing" which interested contractors may secure without obligation from the Universal Crane Co., Lorain, Ohio.

3-Inch Portable Pump

779 Bulletins describing the Homelite 3-inch portable centrifugal pump, which is self-priming and automatic and is claimed to handle 15,000 gallons an hour, may be secured direct from the Homelite Corp., 1007 Riverdale Ave., Port Chester, N. Y.

Tractor Equipment

780 Baker bulldozers, road rooters, tractor scrapers, discing machines and snow plows are described in catalogs which interested contractors and state and county highway officials may secure from the Baker Mfg. Co., 585 Stanford Ave., Springfield, Ill.

Pumps for Cofferdam Dewatering

781 Worthington vertical turbine pumps for cofferdam dewatering, which will handle from 500 to 10,000 gallons a minute, are described in literature which may be secured from Worthington Pump & Machinery Corp., Harrison, N. J.

Rock Drills and Paving Breakers

782 Hardsocg Wonder Drill Co., 227 S. Benton St., Ottumwa, Iowa, will be glad to send on request complete information on its rock drills, paving breakers, sharpening and shanking tools, hose fittings and hose, drill steels and detachable bits.

A ⅜-Yard Full-Revolving Shovel

783 A complete description of the features of the Insley Type K ⅜-yard full-revolving convertible excavator is contained in Catalog No. 112 which the Insley Mfg. Co., 801 North Olney St., Indianapolis, Ind., will be glad to send on request.

Finishing Machine for Roads and Bridges

784 Flexible Road Joint Machine Co., Warren, Ohio, will send on request complete information on its Flex-Plane finishing machines, six of which, ranging from 10 to 40 feet wide, were used in surfacing the concrete runways for the Tri-Borough Bridge in New York City.

Diesel Power for Construction Jobs

785 Complete information on its line of diesel engines for furnishing the heavy-duty power required in construction service may be secured by interested contractors and engineers from the Cummins Engine Co., 606 Wilson St., Columbus, Ind.

Line of Air Compressors

786 LeRoi-Rix air compressors which are available in all mountings, single or two stage, portable or stationary, are described in a catalog which may be secured direct from the Le Roi Co., Milwaukee, Wis.

Snow Fence Piles Snow Off the Road

787 "Can't-Drift" snow fence which piles the snow where you want it and makes the wind sweep the roads clear is described in a circular which may be secured from the Rowe Mfg. Co., Galesburg, Ill.

Asphalt for Every Road Need

788 The Texas Co., Asphalt Sales Dept., 135 E. 42nd St., New York City, will be glad to send complete information on its line of Texaco asphalt products which are accurately refined to every type of road improvement need.

Facts About A-C Motors

789 A new bulletin entitled "Facts for Users of A-C Motors" giving specifications and other information on Lincoln squirrel cage induction a-c motors of ¼ to 200 hp may be secured by those interested from the Lincoln Electric Co., Cleveland, Ohio.

Heavy-Duty Trailers

790 Rogers gooseneck heavy-duty trailers mounted on pneumatic tires, for moving heavy equipment, in a number of sizes and styles to meet varying requirements, are described in Catalog 633 which may be secured direct from Rogers Bros. Corp., Albion, Pa.

Concrete Mixer Charging Plants

791 Johnson concrete mixer charging plants, designed for the use of sacked cement on jobs where the investment required for the storing and handling of bulk cement does not seem feasible or warranted, are described in literature which the C. S. Johnson Co., Champaign, Ill., will be glad to send on request.

Asbestos Bonding for Pipe

792 A new 12-page booklet entitled "Asbestos Bonding" recently issued by the Armco Culvert Manufacturers Association, Middletown, Ohio, describes and illustrates how bituminous material is bonded to galvanized metal so that it will stick indefinitely, for use with Armco paved invert pipe for highway drainage, sewer pipe and similar uses. Copies of this booklet may be secured free upon request by mentioning this magazine.

Don't Wait for the Blizzard

793 Walter Motor Truck Co., 1001-19 Irving Ave., Ridgewood, Long Island, N. Y., calls the attention of snow removal officials to the fact that now is the time to plan next winter's snow removal campaign. This company will be glad to send to such officials complete information on Walter Snow Fighters for bucking the drifts.

One-Man Operated Tractor-Shovel

794 The Trackson tractor-shovel which digs and loads up to 40 cubic yards an hour, requiring only one man for its operation, for use in digging, loading, subgrading, stripping and similar uses, is described in Catalog C-76 which the Trackson Co., Milwaukee, Wis., will send on request.

Conveyor Accessories

795 The complete Conweigh line of anti-friction troughing and return idlers, trippers and accessories is described in a catalog which interested contractors may secure direct from the Portable Machinery Co., Div. of A. B. Farquhar Co., Ltd., Box C-1, York, Pa.

Special and Standard Pipe Machines

796 A new booklet describing Beaver Model A special and standard pipe machines may be secured by those interested direct from Beaver Pipe Tools, Inc., Warren, Ohio.

Profitable Dirt Moving

797 A new folder describing and illustrating Le Tourneau Carryall scrapers which are designed for profitable dirt moving may be secured by interested contractors from R. G. Le Tourneau, Inc., Peoria, Ill., or Stockton, Calif.

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Gas or Diesel Portable Compressors

796 O. K. portable air compressors, equipped with gasoline or diesel engines or electric motors in single or two-stage types, in various capacities, are described and illustrated in Bulletin C-36 which the O. K. Clutch & Machinery Co., Columbia, Pa., will send on request.

Road Maintenance Equipment

799 The new Catalog L, describing and illustrating the complete line of Littleford road maintenance and construction equipment, including asphalt kettles and heaters, pouring pots, surface heaters, traffic line markers, pressure distributors, spraying units, tool boxes and many other items, may be secured without obligation direct from Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio.

New Diesel and Thirty Tractors

800 The new Caterpillar Diesel RD4 and Thirty tractors, the former operating on diesel fuels and the Thirty on tractor fuels and gasoline, both of which are designed for lighter construction jobs and road work, are described in a new 12-page booklet Form 3446 which the Caterpillar Tractor Co., Peoria, Ill., will be glad to send on request.

New Book on Tire Performance

801 The 1936 edition of the Operators' Handbook, containing 66 pages of detailed data on tires and tire performance of interest to owners and operators of trucks and tractors, has just been issued by the B. F. Goodrich Co., Akron, Ohio. Copies may be secured direct from the company.

Dustless Gravel Roads

802 A new pictorial folder describing and illustrating the use of Dowflake calcium chloride to keep gravel roads firm, safe and dustless may be secured by interested contractors and state and county highway officials from the Dow Chemical Co., Midland, Mich.

Line of Road Rollers

803 Austin-Western Roll-A-Planes, a road roller with a hydraulically-operated center roll, as well as its line of Autocrat and Cadet road rollers are described and illustrated in a new Bulletin No. 1614 which may be secured direct from the Austin-Western Road Machinery Co., Aurora, Ill.

New Conveyor Chain Book

804 A new 16-page illustrated Booklet No. 1552 describing the line of RC Silverlink conveyor chains, giving complete dimensions, weights, ultimate strengths and list prices, may be secured upon request from the Link-Belt Co., 307 No. Michigan Ave., Chicago, Ill.

Tensile, Compressive Testing Machines

805 The Southwark-Heydekampf testing machines, the feature of which is the low inertia method of weighing, are described and illustrated in Bulletin 99 which interested contractors and engineers may secure from the Baldwin-Southwark Corp., Southwark Div., Philadelphia, Pa.

Lubricants for Construction Equipment

806 Complete information on Lubriplate lubricants which are made in a variety of types to suit the varying needs of equipment, and which are designed to protect moving parts from wear and corrosion, may be found in a new folder which the Fisk Bros. Refining Co., Lubriplate Div., 24 State St., New York City will be glad to send on request.

Long-Range Tower Machines

807 Sauerman long-range tower dragline machines for excavating, levee and embankment building and similar work, which can be either crawler or rail mounted and operated by electric, steam or gasoline power, and have spans of operation 200 to 1,000 feet, are described and illustrated in literature which may be secured direct from Sauerman Bros., 464 So. Clinton St., Chicago, Ill.

Concrete Curing by Integral Method

808 Complete information on the integral use of calcium chloride for curing concrete and the benefits to be derived by such curing may be secured by interested contractors and engineers from the Calcium Chloride Assn., Penobscot Bldg., Detroit, Mich.

Road Builders' Equipment

for sale. Dredges, Pile Drivers, Drill Boats, fleet of Barges, both steel and wood. Road Rollers, etc. Also steel Hull Dredge, 110 ft. long, 46 ft. beam, 8 ft. deep, drawing 3-9 ft., with two boilers, electric lights, fuel oil. Cost $133,000, built in 1921—good as new. Complete outfit for road and bridge building. Address Box 193, Contractors and Engineers Monthly, 470 4th Ave., New York.

A Mall Gasoline-Engine-Driven Concrete Surfacing Machine

Surfacing Concrete Wet or Dry

Powered with an electric motor or gas engine unit a new surfacing machine for wet rubbing or dry grinding of concrete after the forms are stripped has been announced by the Mall Tool Co., 7740 So. Chicago Ave., Chicago, Ill. The control valve on the wet angle spindle permits the operator to control the flow of water and does away with the old method of applying water to the concrete surface with a brush.

Electric units are furnished in ¾, 1½ and 3-horsepower and variable-speed gas-engine sets in 2 and 3-hp. In addition to concrete rubbing, the 1½ to 3-hp electric and gas engine units can be used to furnish power for concrete vibrating, operating a sump pump, drill, and numerous other attachments.

Truck-Mounted Compressor

A new compressor unit designed specifically for truck mounting with power take-off from the truck propeller shaft to utilize the truck engine for drive has been announced by the Sullivan Machinery Co., Michigan City, Ind. The compressor is of the two-stage air-cooled type with a capacity of 105 cfm, enough to operate a large rock drill or two pavement breakers.

Features of this Truckair unit are forced feed lubrication, anti-friction main bearings, automatic control and small space requirements so that the major part of any truck space can be used for the transportation of materials, tools, etc.

Bulletin A-14, describing this unit fully, may be secured direct from the manufacturer by mentioning this magazine.

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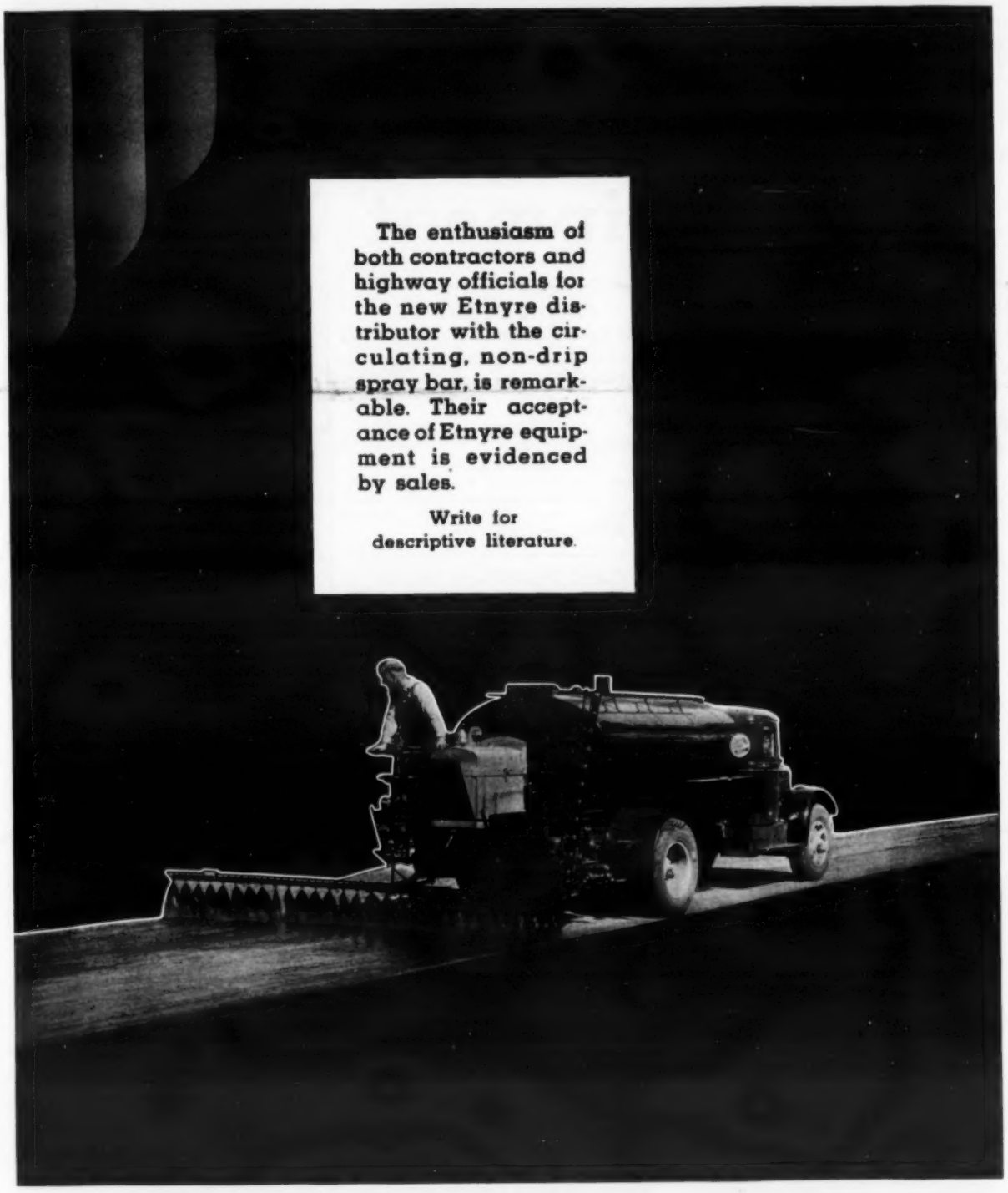

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Making Fills of Wood

We know of wooden legs, arms and the many articles of common use made from the useful products of trees but the use of wood for highway fills is a new one. Out on the Pacific coast, where things are done differently than elsewhere, they have been doing this very thing—wood for highway fills. The situation was this: on the Redwood Highway the clearing through almost virgin territory brought down thousands of trees that could not be burned without creating a serious condition of forest fires in the region and there was no way to dispose of them by hauling out with any degree of economy.

A bright idea came to the engineer in charge, "Redwood is imperishable. Why not put it into the fills and retaining walls?" That is just what was done with a total of 50,000 cubic yards of the redwood trees that were removed during the clearing. A great number of trunks went directly into the fills, some crosswise to stabilize them and others running right along in the fill, taking up their volume of the long embankments needed.

Others were used as solid retaining walls 10 to 12 feet thick at the top and built as gravity sections to confine some of the fills. That is an "unusual occurrence" for the easterner to laugh off if he can.

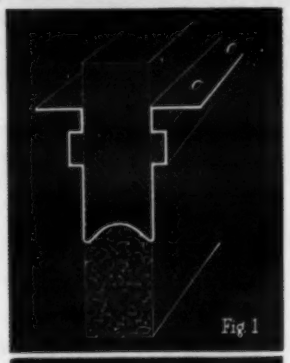
Fig. 1

Fig. 2

SERVICISED

METAL ACCESSORIES FOR HIGHWAY CONSTRUCTION

FIG. 1 illustrates the metal housing for the fibrated asphaltic joint showing control of oozing of upper structure. The base is prepared from a non-oozing material.

FIG. 2 illustrates a fibrated asphalt top showing metal escape containers with a fibrated asphaltic top and a sponge-rubber, cork-rubber or fibre board base. The structure has an intermediate seal.

FIG. 4 illustrates an extruded fibre mastic product provided with grooves for the metal accessories used in connection with flow control. Escape dowel locks and supports and upper escape and seal combination control oozing tendencies in this joint. The metal forms contribute to the rigidity of the joint and afford a simple economical means toward a positive seal. The means of properly housing the dowel bars so as to hold the dowel bar in rigid position while the concrete is being poured is effective and certain.

FIG. 6 illustrates a separate metal housing seal.

FIG. 7 illustrates a metal form for the base seal.

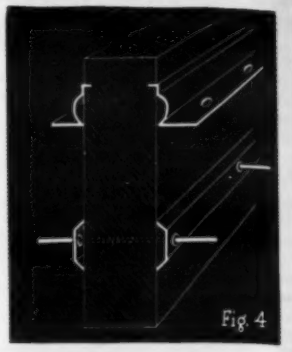
Fig. 4

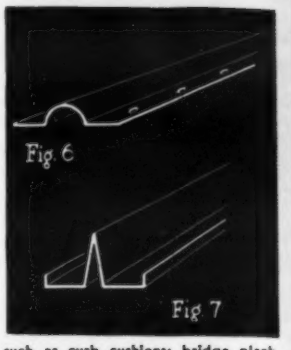
Fig. 6

Fig 7

NOTE: All the benefits of a metal cushion joint are obtained and in addition a waterproof filler and seal with greater flexibility at lower cost.

In conjunction with the above, we furnish extruded fibrated asphalt material with the fibre content in greater relation to the asphalt content so as to furnish some resiliency. This material comes grooved with a suitable affixing of dowel supports and escape cushions.

We also furnish extruded sections such as curb cushions; bridge plank, mineral surfaced, standard and ribbed; and our metal accessories in conjunction with highway and bridge construction.
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GAR WOOD (Isaacson) Bulldozers, &c.
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BUFFALO-SPRINGFIELD Road Rollers
HOUGH-UNIVERSAL Sweepers
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Gardner-Denver Portable Compressors, Jack Hammers, etc.
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Huber Road Rollers
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Jumbo Wheel Scrapers
Le Tourneau Heavy Grading Equipment
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Master Rotary Scrapers
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WARCO Motor Graders
ATLAS Battery Locomotives
AUSTIN Trenching Machines
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INSLEY Cones, Towers, Chuting, Cranes, Shovels, Choker Hooks, Carts
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PAGE—Dragline Buckets
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HOUGH-UNIVERSAL—Sweepers
SULLIVAN—Air Compressors, Tools
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Clyde Hoists, Derricks
Cleveland Formgraders
Diamond Crushers, Screens
Domestic Pumps
Euclid Wagons, Scrapers
Gopher Road Signs
Haiss Loaders
Hercules Road Rollers
Hough-Universal Sweeper
Koppel Industrial Cars
McKiernan-Terry Pile Hammers, Extractors
M-W Lubricants
Michigan Power Shovel
Northern Conveyors
Northwest Shovels, Cranes
Oshkosh 4-whl. Dr. Trucks
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Killefer Scrapers, Road Discs, Rippers
Davey Air Compressors
Cleveland Rock Drills
Lenhart Wagons
Ames Baldwin Wyoming Hand Shovels
Blaw-Knox Ateco Scrapers, Bulldozers
Hansen Gas Shovels, Trirs.
Williamette-Erated Hoists and Winches
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Davenport Gas and Diesel Locomotives
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PARSONS Trenching Machines, etc.
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KWIK-MIX Mixers
RIDDELL Power Grader
JOHNSON Batchers and Demountable Bins
TRACKSON Loaders and Cranes
BYERS Shovels and Cranes
VULCAN Steam and Gas Locomotives
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ROSCO Trailers and Bituminous Distributors
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ATHEY—Crawlers, Dump Wagons, Trailers
BUCYRUS-ERIE — Power Shovels, Cranes, Draglines
PIONEER—Crushers, Gravel Plants
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BUTLER—Bins, Batchers
BARBER-GREENE — Conveyors, Loaders, Ditchers
F. W. D.—Four-Wheel Drive Trucks
PLYMOUTH—Locomotives
GARDNER-DENVER—Air Compressors, Drills
LAPEER TRAILMOBILE—Semi-Trailers
LESCHEN—Wire Rope
BLAW-KNOX — Madsen Asphalt Plants, Ateco Scrapers
LITTLEFORD — Oil Distributors, Tar Kettles, Heaters
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Athey Truss Wheel Co.
Caterpillar Tractor Co.
Killefer Manufacturing Co.
LaPlant-Choate Manufacturing Co.
Pioneer Gravel Equipment Mfg. Co.
Schramm, Inc.
Speeder Machinery Corp.
Anthony Co., Inc.
Willamette-Hyster Co.

Member: Associated Equipment Distributors

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2141 Washington St., Kansas City, Mo.

Representing

Jaeger Machine Co.
Lakewood Engineering Co.
Thew Shovel Co.
Barber-Greene Company
Iowa Manufacturing Co.
McKiernan-Terry Corp.
Whitcomb Locomotive Co.
Butler Bin Co.
"Williams"—Buckets and Trailers
Slusser-McLean Scraper Co.
Ames Baldwin Wyoming Co.
MacWhyte Co.
Red Star Products Co.
Sasgen Derrick Co.
Climax Engineering Co.
Schramm, Inc.

Member: Associated Equipment Distributors

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1325 Macklind Avenue St. Louis, Mo.

Exclusive Distributors for

American Steel Works
Austin-Western Road Machinery Co.
Blaw-Knox Co.
Chain Belt Co.
Dayton Sure Grip & Shore Co.
C. R. Jahn Co.
Kewanee Machinery & Conveyor Co.
Keb Manufacturing Co.
McKiernan-Terry Corp.
Northwest Engineering Co.
R. B. Equipment Mfg. Co.
Sullivan Machinery Co.
Vulcan Locomotive Works
Koppel Industrial Car & Equip. Co.
Barco Mfg. Co.

Member: Associated Equipment Distributors

CORBY SUPPLY COMPANY

3942-46 W. Pine Blvd., St. Louis, Mo.

Representing

AMERICAN—Flexible Metal Hose
BUHL CO.—Portable Air Compressors
CHAMPION RIVET CO.—Rivets and Welding Rod
DETROIT HOIST & MACH. CO.—Air and Electric Hoists
DeVILBISS CO.—Paint Spray Equipment
HARDSOCG WONDER DRILL CO.—Rock Drills and Paving Breakers
WM. H. KELLER, INC.—Super Pneumatic Tools
MUNSELL—Air-Operated Concrete Vibrators
PANGBORN CORP.—Sandblast Equipment
PENNSYLVANIA—Air Compressors and Pumps
DAVID ROUND & SON—Chain Hoists
STAYNEW—Air and Pipeline Filters
N. A. STRAND & CO.—Flexible Shaft Equipment
VAN DORN—Electric Drills, Grinders and Buffers
VICTOR—Welding and Cutting Apparatus
WESTINGHOUSE—Arc Welding Equipment
GUSTAV WIEDEKE CO.—Tube Expanders

JOHN FABICK TRACTOR CO.

Gravois & Iowa Aves. St. Louis, Mo.

Representing

Athey Truss Wheel Co.
Cleveland Rock Drill Co.
Blaw-Knox Company
Caterpillar Tractor Co.
Davey Compressor Co.
Euclid Road Machinery Co.
Killefer Mfg. Co.
LaPlant-Choate Mfg. Co.
Pioneer Gravel Equip. Mfg. Co.
Thew Shovel Company
Williamette-Hyster Co.
W. K. M. Company

Member: Associated Equipment Distributors

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1310 North 13th St. St. Louis, Mo.

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American Steel Scraper & Wheelbarrow Co.
The Baker Mfg. Co.
Wm. Bros Boiler & Equip. Co.
Erie Steel Construction Co.
Gardner-Denver Co.
General Wheelbarrow Co.
Lyle Signs, Inc.
Mall Tool Co.
Toledo Pressed Steel Co.
Aeroil Burner Co., Inc.
Contractors Machinery Corp.
Domestic Engine & Pump Co.
Diamond Iron Works, Inc.
Orr & Sembower, Inc.
Bucyrus-Erie Co.
Construction Machy. Co.
Homestead Valve Mfg. Co.
Mid-West Pipe & Supply Co.
Fairbanks, Morse & Co.

Member: Associated Equipment Distributors

C. F. RABBEITT, INC.

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Cleaver-Brooks Co.
Huber Mfg. Co.
Insley Mfg. Co.
Koehring Co.
Kwik-Mix Mixer Co.
Lidgerwood Mfg. Co.
Littleford Bros.
Parsons Co.
Union Iron Works, Inc.
Butler Bin Co.
Frank G. Hough Co.
Metal Forms Corp.
Thorman W. Rosholt Co.
Sterling Machinery Corp.

Member: Associated Equipment Distributors

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60 Marshall Street Newark, N. J.

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RANSOME Pavers, Mixers, Chuting Equipment
SCHRAMM Air Compressors, Tools
ALLIS-CHALMERS Tractors, Graders
JOHNSON Steel Bins and Batchers
ERIE Gasoline Rollers
MARLOW Centrifugal, Diaphragm and Plunger Pumps
ETNYRE Tar and Asphalt Distributors
WILLIAMS Trailers and Buckets
RED STAR Wheelbarrows, Batch Boxes, Column Clamps and Adjustable Shores
OSGOOD Shovels, Cranes and Draglines
GENERAL Shovels, Cranes and Draglines
HOTCHKISS Road and Sidewalk Forms
VIBRO-CAST & JACKSON Concrete Vibrators and Elec. Power Plants
AMERICAN Snow Plows
HY-WAY Spreaders

GEORGE MALVESE & CO.

New Hyde Park, N. Y.

Long Island Distributors:

CLETRAC Crawler Tractors
"SILVER KING" Tractors
ADAMS Graders
SARGENT Snow Plows
LOCKE Power Mowers
REX Pumps, Mixers
EUCLID Scrapers
OLIVER Implements
BRODERICK & BASCOM Wire Rope
WORTHINGTON Power Mowers

N. P. WALTON, JR.

39 Cortlandt Street New York, N. Y.

Representing

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D. C. ELPHINSTONE, INC.—**"BEST"** Stone and Chip Spreaders
ERIE STEEL CONSTRUCTION CO.—All-Steel Bins, Complete Aggremeter Plants, Erie Buckets, Clamshell, Dragline and Electric
IOWA MFG. CO.—**"CEDAR RAPIDS"** Crushers, Material Handl. Equip.; Sand, Gravel and Asphalt Plants
THE KRON CO.—Full-capacity Springless Dial Scales
HANDY SACK BALER CO.—Cement Sack Cleaners, Balers

THE GEO. F. SMITH CO.

Franklin & Channing Aves., St. Louis, Mo.

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Clyde—Hoists and Derricks
Owen—Clamshell Buckets
Hauck—Heaters
Sasgen—Derricks & Winches
Skilsaw—Electric Saws, Drills
Skelton—Shovels
LeRoi—Engines
Symons—Column Clamps
Winslow—Weighing Scales
Universal—Form Clamps
Link-Belt—Cranes, Shovels, Draglines
Novo—Pumps
Vulcan—Steam and Drop Hammers
Waukesha—Engines
Mall—Vibrators and Grinders
Archer—Tower Equipment
Red Star—Wheelbarrows and Shores
Templeton, Kenly & Co.—Trench Braces, Jacks
Smith—Mixers, Pavers
Vail—Tie Wires and Tools
American Steel & Wire—Rope

Member: Associated Equipment Distributors

CONTRACTORS WHITE SALES CORP.

Wolfert Ave. at Broadway, Albany, N.Y.

Representing

White Motor Co.—Trucks and Buses
Allis-Chalmers Mfg. Co.—Tractors, Road Machy.
Jaeger Machine Co.
General Excavator Co.
Link-Belt Co.
Baker Mfg. Co., Inc.
Huber Mfg. Co.
Hough Universal Sweepers
Main Steel Products Co.
Pioneer Gravel Eq. Mfg. Co.

"Brooks for Concrete Equipment"

R. E. BROOKS COMPANY

Equipment for Contractors

50 Church Street New York, N.Y.

Blaw-Knox Co.—Road and Sidewalk Forms, Bins, Batchers, Finishing Machines, Spreaders, Buckets
Cleaver-Brooks Co.—"OILBILT" Boilers, Tank Car Heaters
Insley Mfg. Co.—Excavators, Concrete Chuting Plants, Buckets, Cars
Koehring Company—Pavers, Mixers, Shovels, Cranes, Mud Jacks
Kwik-Mix Mfg. Co.—Concr. Mixers
Master Vibrator Co.—Concr. Vibrators
Parsons Co.—Trench Machines
Reese Mfg. Co.—Oil Distributors

BREWSTER & WILLIAMS, INC.

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BUTLER Bins and Measuring Hoppers
C. H. & E. Contractors' Pumps, Hoists, Saw Rigs
HAISS Loaders, Excavators, Conveyors and Buckets
HOTCHKISS Steel Forms
LITTLEFORD Asphalt Heaters and Tools
RANSOME Mixers, Pavers, Towers and Chutes
ROGERS Trailers
SULLIVAN Compressors, Drills and Hoists
WEHR Power Graders

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509 No. 27th St. Billings, Mont.
315 2nd Street So. Great Falls, Mont.

Distributors of

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Pioneer Gravel Plant Equip.
Bucyrus-Erie Shovels, Draglines and Cranes
Bucyrus-Erie Loadmasters
Buckeye Ditchers, Backfillers
Buffalo-Springfield Road Rollers
D-A Lubricants, Oils
Hewitt Belting, Hose
Le Tourneau Dirt Moving, Road Bldg. Equip.
Kohler Lighting Plants
LaCrosse Tu-Way Trailers
Hough-Universal Road Sweepers
Standard Paving and Plant-Mix Oiling Plants, Distributors, Trailer Oilers and Heaters
Loschen's Wire Rope
Homestead Hypressure Jenny

Tractor-operated Hoists, Scrapers, Dirtmovers, Rippers, Scarifiers, Bulldozers, Trailbuilders, Backfillers, Snow Plows, Loaders, Track-type and Wheeled Wagons and Trailers, etc.

Member: Associated Equipment Distributors

DOW & COMPANY, INC.

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Exclusive Distributors of

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BARCO—Gasoline Hammers
BURCH—Spreaders, Maintainers, etc.
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CHICAGO PNEUMATIC TOOL CO.—Compressors, Drills
EUCLID—Earth-Moving Equipment
FRINK—Sno Plows
HOUGH-UNIVERSAL—Sweepers
McCORMICK-DEERING—Tractors
"METAFORMS"—Concrete Forms
MOHAWK—"Hotstuf" Kettles, Burners
T. L. SMITH—Mixers, Pavers, Tower Pavers
THEW-LORAIN—Shovels, Cranes
TONCAN—Corrugated Culverts
UNIVERSAL-LORAIN—Shovels, Truck Cranes
WALTER—Snowfighters, Tractor Trucks
"WILLIAMS"—Buckets, Trailers
WILLIAMSPORT—Wire Rope

Member: Associated Equipment Distributors

A. P. DIENST CO., Inc.

Contractors' Supplies

140th St. & 3rd Ave., New York, N. Y.

Distributors for

GREDAG Grease
TOLEDO Bull Frog Wheelbarrows
WYOMING Red Edge Shovels
DUFF Sewer Trench Braces
CURRY Wire Ties
KEYSTONE Grease

Telephone MOtt Haven 9-5430

THE SYRACUSE SUPPLY CO.

314 W. Fayette St. Syracuse, N. Y.

Warehouse 358 W. Jefferson St.

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Barber-Greene Co.
Blaw-Knox Co.
Caterpillar Tractor Co.
Centaur Tractor Co.
Clyde Sales Co.
Goodyear Tire & Rubber Co.
Gorman-Rupp Co.
Goulds Pumps, Inc.
Hazard Wire Rope Co.
Ingersoll-Rand Co.
Johns-Manville (Bridge Plank)
Killefer Mfg. Co.
Koehring Co.
LaPlant-Choate Mfg. Co.
Insley Mfg. Co.
Parsons Co.
Ramsey Pump Co.
Universal Form Clamp Co.
Wickwire Spencer Steel Corp.
Williamsport Wire Rope Co.
Timken Roller Bearing Service & Sales Co.—Timken Bits & Rods
Iowa Mfg. Co.
R. G. LeTourneau, Inc.

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American Cable Co.
Atlas Imp. Diesel Eng. Co.
Butler Bin Co.
Chain Belt Co.
Cleaver-Brooks Co.
Coffing Hoist Co.
Columbia Steel Casting Co.
E. D. Etnyre & Co., Inc.
Elgin Corporation
Euclid Road Machy. Co.
Foote Company
Galion Iron Wks. & Mfg. Co.
Gardner-Denver Co.
Goodyear Tire & Rubber Co.
Jos. F. Kiesler Co.
Hansen Trailers
Hazard Wire Rope Co.
Madsen Iron Works
Marmon-Herrington Co.
Mohawk Asphalt Heater Co.
Novo Engine Co.
Ohio Valley Pulley Works
Portable Machinery Co.
Ramsey Winches
Rotary Snow Plow Co.
Sauerman Bros., Inc.
Thew Shovel Company
Timken Roller Bearing Co.
Willett Mfg. Co.

Member: Associated Equipment Distributors

LLOYD G. ROSS

3090 Main St. Buffalo, N. Y.

Representing

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Hercules Roller Co.

Sale and Rent of All Kinds of Construction Equipment

MAHONEY-CLARKE, INC.

Complete Line of Contractors' Equipment and Supplies.

217 Pearl Street New York, N.Y.

Representing

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Hercules Road Rollers
Schramm Compressors
Marlow Self-Priming Pumps
Munsell Pneumatic Concr. Vibrators
Osgood Shovels, Cranes, etc.
Cleveland Rock Drills, Pneu. Tools
Thurston Detachable Bits
Vulcan Pile Hammers, Extractors, Parts
Wiley Concrete Buckets

Rental Service

NORTH CAROLINA EQ. CO.

P.O. Drawer 426, 3116 Hillsboro St.
RALEIGH, NORTH CAROLINA

Br. Off. & Warehouse—No. 1 London Road Phone 411, Asheville, N. Car.

American Cable Company
Aeroil Burner Company
Buckeye Traction Ditcher Company
Cleveland Rock Drill Co.
Continental Roll & Steel Foundry Co.
Day Pulverizer Company
Euclid Road Machy. Co.
The Four Wh. Dr. Auto Co.
Galion Iron Wks. & Mfg. Co.
Galion Allsteel Body Co.
Good Roads Mach. Corp.
Chas. Hvass & Company
Iowa Manufacturing Co.
Internat'l Harvester Co.
Jaeger-Lakewood Company
Jeffrey Manufacturing Co.
The C. S. Johnson Company
Kensington Steel Company
Kinney Manufacturing Co.
Jos. F. Kiesler Company
Miami Trailer & Scraper Co.
Michigan Power Shovel Co.
Northwest Engineering Co.
Page Engineering Company
Rogers Brothers Corp.
Schramm, Inc.
Waukesha Motor Company
Willett Manufacturing Co.
Wheeled Roller Corporation
Elgin Corporation

Member: Associated Equipment Distributors

NORTHWEST EQUIP. CO., Inc.

Box 1112 Great Falls, Mont.

Complete Line of Road Machinery and Contractors' Equipment

Representing

PIONEER Gravel Equip.
KOEHRING Mixers, Pavers, Shovels
INSLEY Concr. Towers
PARSONS Ditchers
PANTHER Oil, Grease
COLEMAN Trucks
OWEN Buckets
SCHRAMM Air Compressors
MacWHYTE Rope
CLEVELAND Rock Drills

Steel Bridges and Traffic Treads, Fresnos, Plows, Scrapers, etc.

EUGENE F. VAN NAME

116 John Street Horseheads, N. Y.

Representing

ALLIS-CHALMERS—Tractors, Graders
A-W—Traffic Tread
BAKER—Road Drags, Snow Plows
C. M. C.—Wonder & Marsh-Capron Mixers
HUBER—Rollers
HOTCHKISS—Sidewalk Forms
HANSON—Excavators
INGERSOLL-RAND—Air Compressors
JACKSON—Wheelbarrows
MILES—Concrete Block Machines
THE NORTHERN—Gravel & Coal Conveyors
WILLIAMSPORT—Wire Rope
WISCONSIN SPECIAL—Snow Plows

H. O. PENN MACHY. CO., INC.

140th St. & East River Bronx, N. Y.

Representing

CATERPILLAR Tractors and Accessories
LaPLANT-CHOATE MFG. CO.
ATHEY TRUSS WHEEL CO.
BLAW-KNOX Dirt-Moving Eq.
R. G. LeTOURNEAU, INC.
MARION Shovels, ⅝-2 yds.
SPEEDER Shovels, ½-¾ yd.
DEERE Indus. Tractors
SMITH Mixers, Pavers
LeROI Compressors, Engines
HELTZEL Steel Bins, Forms
FRINK Sno Plows
MARLOW Pumps
KIESLER Buckets

Warehouse Stock—Service Station

Member: Associated Equipment Distributors

CAROLINA TRACTOR & EQUIPMENT COMPANY

S. Main Ext. Salisbury, N. Car.

Branch Office and Warehouse:
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ETNYRE—Bituminous Distributors, Flushers
GORMAN-RUPP—Centrifugal Pumps
CATERPILLAR—Tractors, Graders, Power Plants
BLAW-KNOX—Steel Forms, Bins, Buckets, Trukmixers
BARBER-GREENE—Conveyors, Car Unloaders
DIAMOND—Roll, Jaw Crushers
HERCULES—Gas Road Rollers
LaPLANT-CHOATE—Wagons, Bulldozers
SLUSSER-MacLEAN—Wheelers, Rippers, Fresnos
THEW—Shovels, Cranes
WONDER—Mixers, Pumps, Hoists
GARDNER-DENVER—Air Compressors, Drills
LaCROSSE—Trailers
LeTOURNEAU—Carry-All Scrapers

Member: Associated Equipment Distributors

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6th Ave. and F St. Belmar, N. J.

JAEGER Concrete Mixers
JAEGER Placing Plants
AEROIL Torches, Heaters

Steel Sidewalk and Curb Forms
"Mud Hog" Pumps
Material Elevators
Air Compressors
Gasoline Hoists
Trench Pumps
Carbic Lights
Wheelbarrows
Mortar Tubs
Steel Mortar Boxes
Picks and Shovels
Tarpaulins
Scaffold Horses
Electric Drills & Saws
Chain Hoists

JOHN R. TINKLEPAUGH

LIVINGSTON NEW YORK

also

924 Central Avenue, Albany, N.Y.

Representing

Cleveland Tractor Company
Gar Wood Industries, Inc.
York Modern Corporation
Oshkosh Motor Truck Mfg. Co.
Euclid Road Machy. Co.
Killefer Mfg. Co.
Main Steel Products Co.

JOHN REINER & CO., Inc.

29 Howard St. New York, N. Y.

Representing

NOVO ENGINE CO.—Gasoline Engines
WISCONSIN MOTOR CORP.—Gasoline Engines and Power Units
PERFEX RADIATOR CO.—Radiators
STOVER MFG. & ENGINE CO.—Diesel Engines, Generating Sets
TWIN DISC CLUTCH CO.—Clutches

Telephone CAnal 6-0286

THE BLAISDELL-FOLZ EQUIP. CO.

2143-2147 Barnard St. Cincinnati, Ohio

Representing

Allis-Chalmers Mfg. Co.—Tractors, Road Machinery
Chain Belt Co.—Rex Pavers, Moto-Mixers, Building Mixers and Pumps
Northwest Engineering Co.—Gasoline Shovels, Cranes, Draglines, Pull Shovels
Ingersoll-Rand Co.—Compressors, Pneumatic Tools, Pumps
Clyde Sales Co.—Hoisting Engines, Derricks
Drave-Doyle Co.—American Tubular Towers
Sauerman Bros., Inc.—Cableways, Power Scrapers, Excavators
Universal Crusher Co.—Crushers
The C. S. Johnson Co.—Bins, Batchers
Deister Machine Co.—Plat-O Vibrator Screens
Vulcan Iron Works—Pile Hammers
Wellman Engineering Co.—Clamshell, Dragline Buckets
Sasgen Derrick Co.—Derricks

Member: Associated Equipment Distributors

DALE & RANKIN, INC.

113 Frelinghuysen Ave., Newark, N. J.

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HELTZEL Road Forms and Bins
P & H Cranes and Excavating Equipment
P & H Hansen Electric Arc Welders
INGERSOLL-RAND Compressors and Tools
STERLING Wheelbarrows
AEROIL Heaters and Tools
ALEMITE Guns and Fittings
REX Mixers and Pavers
REX Pumps
REX Saw Rigs
UNIVERSAL Concrete Accessories
VIBER Elec. & Pneu. Concrete Vibrators
WINSLOW Scales

Member: Associated Equipment Distributors

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HUMPHREYS MFG. CO.—Diaphram, Plunger and Centrifugal Pumps
LEACH CO.—Concrete Mixers
INGERSOLL-RAND CO.—Air Compressors
COMPLETE—Wellpoint Systems
KADCO CORP.—Dust Control Equipment
RENTAL SERVICE

Member: Associated Equipment Distributors

UNITED HOISTING CO., INC.

165 Locust Avenue
NEW YORK, N. Y.

Representing

Sullivan Machinery Co.
Construction Machinery Co.
White Mfg. Co.

Member: Associated Equipment Distributors

THE CLETRAC OHIO SALES CO.

E. 193rd Street and Euclid Ave.
Cleveland Ohio

Representing

THE CLEVELAND TRACTOR CO.—Crawler Tractors
THE DAVEY COMPRESSOR CO.—Air-Cooled Compressors
THE EUCLID ROAD MACHY. CO.—Crawler Wagons, Scrapers
MAIN STEEL PRODUCTS CO.—Snow Plows
D-A LUBRICANT CO.—Oil
THE ROC COMPANY—Winches

LOOK THIS DIRECTORY OVER CAREFULLY

If you find any errors while checking over this directory will you please advise us, because it is our desire to keep it accurate and up to date at all times.

CONTRACTORS AND ENGINEERS MONTHLY

470 Fourth Avenue New York

HOWARD-COOPER CORPORATION

Portland — Seattle — Spokane — Twin Falls

Representing

Internat'l Harvester Co. (McCormick-Deering Industrial Tractors)
Barber-Greene Co.
Cleveland Rock Drill Co.
Marion Steam Shovel Co.
Hughes-Keenan Co.
Cleaver-Brooks Co.
The Jaeger Machine Co.
Nordberg Mfg. Co. (Symons Crushers)
McKiernan-Terry Corp.
Rotary Snow Plow Co.
Schramm, Inc. (Compressors)
Universal Power Shovel Co.
Buda Co. (Diesel & Gas. Eng.)
Baker Mfg. Co.
Walter Motor Truck Co.
Seagrave Corp.
B. F. Goodrich Rubber Co. (Fire Hose)
Winslow (Scales)
Hercules Company
Sterling Wheelbarrow Co.
Root Spring Scraper Co.
White Mfg. Co.
Erie Steel Const. Co.
Wheeled Roller Corp.
J. D. Adams Co.

Member: Associated Equipment Distributors

ALLEGHENY EQUIPMENT CORPORATION

P. O. Box 1888 Pittsburgh, Pa.

Distributors for

ALLIS-CHALMERS Tractors and Allied Tractor Equipment
GARDNER-DENVER Compressors and Drills
HERCULES Road Rollers
HOUGH "Universal" Road Sweepers
JACKSON Concrete Placement Vibrators
LINK-BELT Power Shovels and Cranes
MICHIGAN ⅜-yd. Truck and Crawler Shovels and Cranes

PHILLIPS MACHINERY CO.

900 East Cary St. Richmond, Va.

Representing

Austin Machinery Corp.
Clyde Sales Co.
Chicago Automatic Conveyor Co.
DeWalt Products Corp.
Erie Steel Construction Co.
Jackson Mfg. Co.
Sauerman Brothers, Inc.
Chicago Pneumatic Tool Co.
Stephens-Adamson Mfg. Co.
Rogers Brothers Corp.
General Excavator Co.
Aeroil Burner Co.
Manitowoc Engineering Works
Broderick & Bascom Rope Co.
Chain Belt Company
Van Dorn Electric Tool Co.
Also many other lines of Contractors' Equipment

Member: Associated Equipment Distributors

H. B. FULLER EQUIP. CO.

1836 Euclid Ave. Cleveland, Ohio

Representing

Blaw-Knox Company—Bins, Batches, Forms, Trukmixers, Buckets, ORD Finishing Machines, Asphalt Plants
Link-Belt Co.—Shovels, Cranes, Draglines, Locomotive Cranes
Rassome Constr. Machy. Co.—Pavers, Constr. Mixers, Towers and Chuting Equip.
Baldwin Locomotive Works (Internal Combustion Division—"Whitcomb Locomotives")—Gasoline, Diesel, Elec. and Storage Battery Locomotives
Electric Tamper & Equip. Co.—Concrete Vibrators, Elec. Tampers
Moritz-Bennett Corp.—Rd. Shoulder Finishers, Form Pullers
Concrete Surfacing Machinery Co.—"Berg" Surfacers
C. H. & E. Mfg. Co.—Pumps, Saw Rigs, Hoists, Mixers, etc.
Gruendler Crusher & Pulv. Co.—Hammer Mills, Shredders, Jaw Crushers, Screens, etc.

GASH-STULL CO.

Chester Pennsylvania

Representing

FORDSON Tractor and Equipment
UNIVERSAL POWER SHOVEL CO. Unit Shovels ⅜ to ½-yd.
OSGOOD Shovels—all types
WEHR CO.—Road Graders, all sizes
TRACKSON CO.—Crawler Wagons, Crawlers
MICHIGAN Power Shovels
SCHRAMM Compressors

LOCOMOTIVES
HOISTS — SCRAPERS — WIRE ROPE
MANGANESE DIPPER TEETH

WESTERN MATERIAL CO.

Aberdeen, Sioux Falls, Rapid City, S. D.

Ateco Dirt Moving Equip.
Barber-Greene Conveyors, Loaders, Ditchers
Bros Snow Plows, Rd. Bldrs.
Bucyrus-Erie Loadmaster
"Caterpillar" Equipment
Chain Belt Mixers, Pumps
Cleaver-Brooks Tank Car Heaters
Clyde Hoists, Derricks
Day Crushers
Hough Sweepers
LaPlant-Choate Equipment
Lenhart Wagons
LeTourneau Road Equip.
Linn Tractor-Trucks
Littleford Bros. Equip.
M & M Wire Clamps
Pioneer Gravel Equip.
Philip Carey Elastite
St. Paul Bodies, Hoists
Schramm Air Compressors
Sterling Wheelbarrows, Carts
Stolle Stone Spreaders
Toro Mowers
Walter Motor Trucks
Wausau Snow Plows
Willamette-Hyster Hoists
Wood Shovels

Member: Associated Equipment Distributors

PACIFIC HOIST & DERRICK CO.

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3200 4th So. Seattle, Wash

Representing

NORTHWEST—Gas and Electric Shovels, Cranes and Draglines
BUHL—Air Compressors
TWIN DISC—Clutches for all purposes
PAGE—Scraper Buckets, Diesel Draglines
MINNEAPOLIS—"Twin City" Gas Engines
CLIMAX—Gasoline Engines
WISCONSIN—Gasoline Engines
MARMON-HERRINGTON—Trucks
DAKE ENGINE CO.
PIONEER—Gravel Equipment
ISAACSON IRON WORKS—Buckets
CLETRAC—Tractors

Member: Associated Equipment Distributors

INDUSTRIAL ENGINE PARTS, INC.

1053 E. 61st St. Cleveland, Ohio

Representing

Minneapolis-Moline Power Impl. Co.
Climax Engineering Co. Twin Disc Clutch Co.
Fuller & Johnson Mfg. Co.
Wisconsin Motor Corp. (Air-Cooled)
Stover Engine & Mfg. Co.
Scintilla Magneto Co.
Wico Electric Co. Pierce-Governor Co.
Portable Power Tool Corp. Hercules-Servel, Inc.
LeRoi Co.

EDELEN & BOYER COMPANY

Office and Warehouse: 236 North 23rd St. Philadelphia Penna.

Distributors of

Osgood Shovels, Cranes
General Shovels, Cranes
Multi Foote Pavers
Adsun Black Top Pavers
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Heltzel Finishing Mach.
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Contractors and Engineers Monthly

C. & E. M. Photo

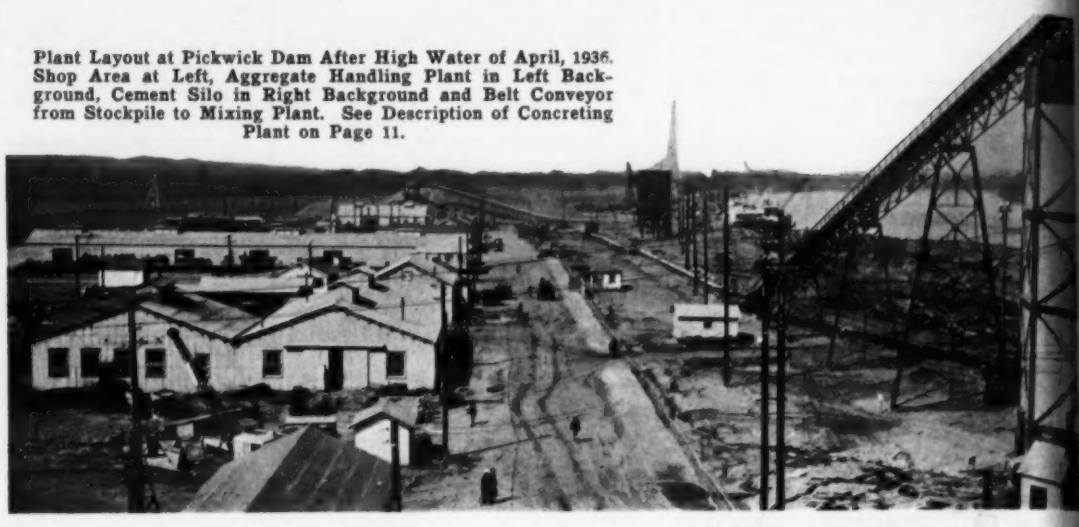
The Old Black Hall River Bridge As Seen Across the Cofferdam of the New Structure Which Will Replace It. See Page 1.

A Huge Traveling Furnace Is Being Used by the Main Roads Commissions of New South Wales and Queensland to Bake the Soil Into a Stable Foundation. See Page 23.

C. & E. M. Photo

The "Slow" Sign, Which Protects Mass. Maintenance Crew at Work, Takes a Ride. See Page 6.

Plant Layout at Pickwick Dam After High Water of April, 1936. Shop Area at Left, Aggregate Handling Plant in Left Background, Cement Silo in Right Background and Belt Conveyor from Stockpile to Mixing Plant. See Description of Concreting Plant on Page 11.



"In The Blue Ridge Mountains of Virginia" Goes the Old Song. And So Goes the Work on the Skyline Highway. At The Right Is a 2-Yard Lorain 87 Excavator Doing Its Share on the Ralph E. Mills Co. 8-Mile Contract near Waynesboro, Involving 350,000 Cubic Yards of Excavation.

No, Not a Weird Species of Animals in the Zoo! Just Two Arc Welding Operators Joining Steel to Steel with Lincoln Welding Equipment for the Reinforcing for 16-Foot Diameter Concrete Pipe for the $283,000,000 Colorado River Aqueduct.

Construction of the Timber Crib for Block 40 Inside the Existing Cofferdam at Grand Coulee. See Page 15.

Typical Operations at Coyote Dam, One of the Seven Santa Clara Valley Water Conservation District Dams in California. See Page 2.